UNIVERSITY OF ST. LA SALLE

Bachelor of Science in Chemical Engineering

Center of Development
2009-2015

Program Description

Bachelor of Science in Chemical Engineering is a profession that involves the conceptualization, development, design, improvement and application of safe, healthy, ethical and economic ways of utilizing materials and energy in unit processes and operations for the benefit of society and the environment through the knowledge of mathematics, chemistry, biology, information technology and other natural, applied and social sciences, gained by study, research and practice.

Chemical Engineering is one of the broader fields of engineering disciplines both in terms of the range of problems that fall within its purview and in the range of knowledge required to solve those problems

Program Educational Objectives

Within three to five years after obtaining a Bachelor's degree in Chemical Engineering at University of St. La Salle, a graduate is expected to have:

1. Successful career in chemical engineering and /or related fields, and be prepared to pursue a broad range of chemical engineering-related career and graduate school opportunities.
2. Utilize his/her knowledge in chemical engineering and effectively contribute to address contemporary chemical engineering issues for society as well as to the profession. Manifest ability to communicate effectively both in written, oral or visual forms through writing research report and presentation.
3. Sense of social responsibility through participating in community based activities and professional commitment by being actively involved in professional organizations in the field of Chemical Engineering as well as community-based organizations.

Program Outcomes

By the time of graduation, the students of the program shall be able to:

a. apply thorough knowledge of mathematics and sciences in solving for material and energy balances with other pertinent equations involved in complex Chemical Engineering Subjects
b. design and conduct experiments to test hypothesis and verify assumptions, analyze and interpret data and to simulate Chemical Engineering processes;
c. design a physical or chemical system, component, or process to meet industry needs within realistic constraints, in accordance and compliance with standards set for sustainability;
d. function well in the industry where multidisciplinary and multi-cultural teams collaborate in the attainment of processed set goals;
e. identify, formulate and solve complex chemical engineering problems with the comprehensive application of the concepts on Unit Operations, Chemical Process Industries and Instrumentation and Process Control;
f. apply professional and ethical responsibility in the creation of innovations and become professionals who are morally and legally conscious in the practice of their professions;

g. communicate effectively complex chemical engineering activities with the engineering community and with the society at large and explain the role of each member of the community in the sustainability of such activity;
h. understand the impact of chemical engineering solutions in a global, economic, environmental and societal context and its significance in the improvement and preservation of life in general;
i. pursue life-long learning in the context of innovation, research, technological developments and environmental protection;
j. use inquiry skills to examine the chemical engineering issues that impact the contemporary world and engage in research and problem solving in order to better understand and assess the significance of the chemical engineering field in these issues;
k. use modern computational engineering tools, soft wares or instruments in processing problems involving chemical engineering
l. develop inter-personal, managerial and communication skills, and cultivate professional ethics and values needed to collaborate with other fields of study for the growth of oneself and that of the organization as a whole;
m. focus on at least one specialized field of practice in preparation for those who will pursue graduate work and those who will venture into the field of research and development

Admission Requirements

1. Students seeking admission to the program must have a GPA of at least 80%;
2. Students admitted on probation must comply with the terms and conditions set by the University.

Retention Policies (In addition to the University's standard retention policy)

Load limit of students with **FAILURES, SUBJECTS DROPPED or WITHDRAWN**:

1. A student with **one(1) subject failed, dropped or withdrawn** will carry a maximum load of **21 units** the following semester.
2. A student with **2 or 3 subjects failed, dropped or withdrawn** will carry a maximum load of **18 units** the following semester.

A student will be dismissed from the ChE program if:

1. He/she incurs failures in Chemistry for Engineers (lec/lab), Calculus 1, Calculus 2, Physics for Engineers, Analytical Chemistry, Chemical Engineering Calculations, Physical Chemistry for Engineers and Momentum Transfer.
2. He/she incurs an accumulated 18 units of failure.
3. He/she fails the Admissions Exam for Chemical Engineering Students administered on the Summer of his/her First Year.

UNIVERSITY OF ST. LA SALLE

BACHELOR OF SCIENCE
Chemical Engineering

First Year

First Semester		Total Credit Units	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
EMA100	Algebra & Trigonometry	3	2	3	5	NONE	NONE
EMA101	Calculus 1 (Differential Calculus)	4	4	0	4	NONE	EMA100
CHM101E	Chemistry for Engineers	4	4	0	4	NONE	NONE
CHM101EL	Chemistry for Engineers Lab	1	0	3	3	NONE	NONE
MATHMW	Mathematics in the Modern World	3	3	0	3	NONE	NONE
NSTP1	NSTP 1	3	3	0	3	NONE	NONE
PED1	Physical Education 1 (Wellness and Fitness)	2	2	0	2	NONE	NONE
RHIST	Readings in Philippine History	3	3	0	3	NONE	NONE
USELF	Understanding the Self	3	3	0	3	NONE	NONE
IRS1	Lasallian Spirituality	3	3	0	3	NONE	NONE
IGG	GG 1	1.5	1.5	0	1.5	NONE	NONE
	Total	**30.5**	**28.5**	**6**	**34.5**		

Second Semester		Total Credit Units	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
ECHE101	Analytical Chemistry	5	4	3	7	CHM101E	NONE
ARTAP	Art Appreciation	3	3	0	3	NONE	NONE
EMA 102	Calculus 2 (Integral Calculus)	4	4	0	4	EMA101	NONE
CFP101	Computer Fundamentals and Programming	1	0	3	3	NONE	NONE
NSTP2	NSTP 2	3	3	0	3	NSTP1	NONE
PED2	Physical Education 2 (Team Sports and Rhythmic Activities)	2	2	0	2	PED1	NONE
PHY101EC	Physics for Engineers (lecture)	4	3	3	6	EMA101	NONE
PHY101EL	Physics for Engineers Laboratory	1	0	3	3	NONE	PHY101E
GE 101	Engineering Drawing	1	0	3	3	NONE	NONE
IRS2	Christian Morality	3	3	0	3	NONE	NONE
	Total	**27**	**22**	**15**	**37**		

Second Year

First Semester		Total Credit Units	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
ECHE102	Chemical Engineering Calculations	3	2	3	5	CHM101E	NONE
EMA103	Differential Equation	3	3	0	3	EMA102	NONE
EMA104	Engineering Data Analysis	3	3	0	3	EMA101	NONE
GE102C	Engineering Mechanics w/ Strength of Materials	3	2	3	5	PHY101E	NONE
RIZAL	Life and Works of Rizal	3	3	0	3	NONE	NONE
ECHE103	Organic Chemistry	5	4	3	7	ECHE101	NONE
PED3	Physical Education 3 (Swimming and Recreation)	2	2	0	2	PED1	NONE
LITE	Living in the IT Era	3	3	0	3	NONE	NONE
	Total	**25**	**22**	**9**	**31**		

Second Semester		Total Credit Units	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
ECHE104	Advanced Engineering Mathematics for ChE	3	3	0	3	EMA103	NONE
GE103	Computer-Aided Design	1	0	3	3	GE101	NONE
GE104	Fundamentals of Materials Science and Eng'g	3	3	0	3	ECHE103	NONE
ECHE105	Momentum Transfer	3	2	3	5	ECHE102 EMA103	NONE
GENSOC	Gender and Society	3	3	0	3	NONE	NONE
PED4	Physical Education 4 (Individual and Dual Sports)	2	2	0	2	PED1	NONE
PCHEM101	Physical Chemistry for Engrs 1	3	2	3	5	ECHE101 EMA102	NONE
PCOM	Purposive Communication	3	3	0	3	NONE	NONE
GBOOKS	Great Books	3	3	0	3	NONE	NONE
STS	Science, Technology and Society	3	3	0	3	NONE	NONE
	Total	**27**	**24**	**9**	**33**		

THIRD YEAR

First Semester		Total Credit Units	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
BEE200	Basic Electrical and Electronics Engineering	3	2	3	5	PHY101E	NONE
ECHE106	Chemical Engineering Thermodynamics	3	2	3	5	ECHE102 PCHEM101	NONE
CACHE	Computer Applications in ChE	1	0	3	3	CFP101	NONE
GE105	Environmental Science and Engineering w/ GIS	3	3	0	3	NONE	NONE
ECHE107	Heat and Mass Transfer (HMT)	4	3	3	6	ECHE105	NONE
ECHE108	Methods of Research	1	0	3	3	PCHEM101 ECHE102 PCOM EMA104	NONE
PCHEM102	Phyiscal Chemistry for Engineers 2	3	2	3	5	Science Lab (Physical Chemistry)	NONE
GE106	Engineering Economics	3	3	0	3	3rd Yr Standing	NONE
EIA1C	Engineering Intensive Appraisal for ChE 1	1	0	3	3	EMA101 EMA102 EMA103 EMA104	NONE
	Total	**22**	**15**	**21**	**36**		

Second Semester		Total Credit Units	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
ECHE109L	Chemical Engineering Lab 1	1	0	3	3	ECHE105 ECHE107	NONE
ECHE110	Chemical Process Industries (CPI)	3	3	0	3	ECHE103	NONE
ECHE111	Chemical Reaction Engineering (CRE)	4	3	3	6	PCHEM102 ECHE104 ECHE107	NONE
ECHE112	Particle Technology	3	2	3	5	ECHE105	NONE
ECHE113	Separation Process	3	2	3	5	ECHE106 ECHE107	NONE
ECHE114	Solution Thermodynamics	3	2	3	5	ECHE106	

						ECHE104 CACHE	NONE
ECHE115	Food Processing Technologies	3	3	0	3	3rd Yr Standing	NONE
ETHICS	Ethics	3	3	0	3	3rd Yr Standing	NONE
EIA2C	Engineering Intensive Appraisal 2 for ChE	1	0	3	3	PHY101E GE102 GE106 ECHE104	NONE
	Total	**24**	**18**	**18**	**36**		

Summer or Third Term		**Total Credit Units**	**No. of hrs Lec**	**Lab**	**Total Assessed Units**	**Pre-requisite**	**Co-requisite**
CHEMIM	Chemical Engineering Immersion	2	0	0	2	3rd Yr Standing	

FOURTH YEAR

First Semester		**Total Credit Units**	**No. of hrs Lec**	**Lab**	**Total Assessed Units**	**Pre-requisite**	**Co-requisite**
ECHE116	Biochemical Engineering	3	3	0	3	ECHE111 ECHE103	NONE
CED101	Chemical Engineering Design 1	2	1	3	4	ECHE110 ECHE111 ECHE112	NONE
CED101L	Chemical Engineering Lab 2	1	0	3	3	ECHE109L	NONE
CPL101L	Chemical Process Lab	1	0	3	3	NONE	CED101
GE107	Engineering Management	2	2	0	2	GE106	NONE
ECHE122	Process Dynamics and Control	3	2	3	5	ECHE104	NONE
CLE101	Chemical Engineering Laws and Ethics	1	1	0	1	ETHICS	NONE
ECHE118	Environmental Impact Assessment	3	3	0	3	GE105	NONE
ECHE117	Process Safety	1	1	0	1	4th Yr Standing	NONE
EIA3C	Engineering Intensive Appraisal for ChE 3	1	0	3	3	CHM101E GE105, PCHEM101, PCHEM102, ECHE101, ECHE103, ECHE106	NONE
	Total	**18**	**13**	**15**	**28**		

Second Semester		**Total Credit Units**	**No. of hrs Lec**	**Lab**	**Total Assessed Units**	**Pre-requisite**	**Co-requisite**
ECHE119	Chemical Engineering Design 2	3	2	3	5	CED101	NONE
PSPEAK	Public Speaking	3	3	0	3	NONE	NONE
ECHE120	Industrial Waste Management and Control	3	3	0	3	GE105, ECHE112	NONE
ECHE121	Plant Inspections and Seminars	1	0	3	3	CED101	NONE
GE108	Technoprenuership	3	3	0	3	GE106, GE107	NONE
ECHE123	Solid Waste Management	3	3	0	3	ECHE118	NONE
CWRLD	The Contemporary World	3	3	0	3	NONE	NONE
EIA4C	Engineering Intensive Appraisal for ChE 4	1	0	3	3	ECHE102,	

					ECHE107, ECHE110, ECHE111, ECHE112, ECHE113, ECHE114, ECHE116, ECHE122, CED101	NONE
Total	**20**	**17**	**9**	**26**		

UNIVERSITY OF ST. LASALLE

SUMMARY OF REQUIRED COURSES
BS Chemical Engineering

	Course Required	No. of Equivalent	Unit Total Units
Technical Courses			
Mathematics			
Algebra & Trigonometry	1	3	
Calculus 1 – 2	2	8	
Differential Equation	1	3	14
Natural/Physical Sciences			
Chemistry for Engineers	2	5	
Physics for Engineers	2	5	10
Basic Engineering Sciences			
Computer Fundamentals and Programming	1	1	
Engineering Drawing	1	1	
Engineering Data Analysis	1	3	
Engineering Mechanics and Strength of Materials	1	3	
Computer-Aided Design	1	1	
Engineering Economics	1	3	
Engineering Management	1	2	
Technoprenuership	1	3	17
Allied Courses			
Fundamentals of Materials Science and Engineering	1	3	
Basic Electrical and Electronics Engineering	2	3	
Environmental Science and Engineering	1	3	
Analytical Chemistry	2	5	
Organic Chemistry	2	5	19
Professional Courses			
Advanced Engineering Mathematics for ChE	1	3	
Chemical Engineering Calculations	1	3	
Momentum Transfer	2	3	
Physical Chemistry for Engineers 1	2	3	
Physical Chemistry for Engineers 2	2	3	
Chemical Engineering Thermodynamics	1	3	
Computer Applications in ChE	1	1	
Heat and Mass Transfer Lecture	2	4	
Chemical Process Industries	1	3	
Chemical Reaction Engineering	2	4	
Particle Technology Lecture	2	3	
Separation Process Lecture	2	3	
Solution Thermodynamics	1	3	
Chemical Engineering Immersion	1	2	
Biochemical Engineering	1	3	
Chemical Engineering Laws and Ethics	1	1	
Process Safety	1	1	
Industrial Waste Management and Control	1	3	
Plant Inspections and Seminars	1	1	
Process Dynamics and Control	2	3	
Methods of Research	1	1	
Chemical Engineering Design 1– 2	4	5	
Chemical Engineering Lab 1– 2	2	2	
Chemical Process Lab	1	1	
Food Processing Technologies	1	3	
Environmental Impact Assessment	1	3	
Solid Waste Management	1	3	
Engineering Intensive Appraisal1-4 for CHE	4	4	75

General Education/Mandated			
Mathematics in the Modern World	1	3	
NSTP 1– 2	2	6	
Readings in Philippine History	1	3	
Understanding the Self	1	3	
Art Appreciation	1	3	
Life and Works of Rizal	1	3	
Purposive Communication	1	3	
Science, Technology and Society	1	3	
Ethics	1	3	
The Contemporary World	1	3	
Life in the IT Era	1	3	
Gender & Society	1	3	
Physical Education 1– 4	4	8	47
Institutional Courses			
GG 1	1	1.5	
Lasallian Spirituality	1	3	
Lasallian Formation on Christian Morality	1	3	
Public Speaking	1	3	10.5
	Total		**192.5**

MAJOR COURSE DESCRIPTION
Bachelor of Science in Chemical Engineering (BSChE)

EMA100 **3 Units**
Algebra and Trigonometry
The course is designed to strengthen and increase the understanding of basic algebraic concepts of engineering students. Topics in algebra include algebraic, rational, exponential, and logarithmic functions and their graphs; systems of equations; linear, quadratic and higher degree polynomials; and word problems. Moreover, the course will also reinforce the trigonometry skills and concepts essential to success in calculus. Topics in trigonometry include trigonometric and inverse trigonometric functions and their graphs; proving identities; solving trigonometric equations; application of the law of the sines and cosines in simplifying trigonometric expressions; and conic sections.

As evidence of attaining the learning outcomes, the students are required to submit collaborative works on:

1. the use of algebraic concepts in solving real life applications.
2. the use of trigonometric concepts and principles in solving practical engineering problems.
3. the use of any mathematical software in solving systems of linear equations.

EMA101 **4 units**
CALCULUS 1
An introductory course covering the core concepts of limit, continuity, and differentiability of functions involving one or more variables. This also includes the application of differential calculations in solving problems on optimization, rates of change, related rates, tangents and normals, and approximations; partial differentiation and transcendental curve tracing.

As evidence of attaining the learning outcomes, the students are required to submit collaborative works on exploring the use of any mathematical software in curve sketching, locating the maximum and minimum value(s) of a function, and identifying one (1) real world application of derivatives.

EMA102 **4 units**
CALCULUS 2
The course introduces the concept of integration and its application to some physical problems such as evaluation of areas, volumes of revolution, force, and work. The fundamental formulas and various techniques of integration are taken up and applied to both single variable and multi-variable functions. The course also includes tracing of functions of two variables for a better appreciation of the interpretation of the double and triple integral as volume of a three-dimensional region bounded by two or more surfaces.

As evidence of attaining the learning outcomes, the students are required to submit collaborative works on utilizing definite integration in finding the area of a plane region as well as the volume of a solid of revolution, and utilize the integral to solve conceptual and real-world problems.
Prerequisites: Calculus 1

EMA103 **3 units**
DIFFERENTIAL EQUATIONS
This course is intended for all engineering students to have a firm foundation on differential equations in preparation for their degree-specific advanced mathematics courses. It covers first order differential equations, nth order linear differential equations and systems of first order linear differential equations. It also introduces the concept of Laplace Transforms in solving differential equations.

As evidence of attaining the learning outcomes, the students are required to submit collaborative works on exploring the use of any mathematical software in solving ordinary differential equations, and identify practical engineering and scientific problems solved using differential equations.
Prerequisites: Calculus 2

EMA104 **3 units**
ENGINEERING DATA ANALYSIS
This course is designed for undergraduate engineering students with emphasis on problem solving related to societal issues that engineers and scientists are called upon to solve. It introduces different methods of data collection and the suitability of using a particular method for a given situation. The relationship of probability to statistics is also discussed, providing students with the tools they need to understand how "chance" plays a role in statistical analysis. Probability distributions of random variables and their uses are also considered, along with a discussion of linear functions of random variables within the context of their application to data analysis and inference. The course also includes estimation techniques for unknown parameters; and hypothesis testing used in making inferences from sample to population; inference for regression parameters and build models for estimating means and predicting future values of key variables under study.

After completing this course, the students are required to device a collaborative work on a statistically based experimental design, and analyze the outcomes of the designed experiment with the aid of a statistical tool/software.
Prerequisites: Calculus 1

GE 101 **1 unit**
ENGINEERING DRAWING
This subject introduces student to the use of technical drawing in an effective way for communicating and integrating engineering concepts.

By the end of the course, students must be able to submit a portfolio of all their course works.

GE102 **3 units**
ENGINEERING MECHANICS
This course in engineering mechanics deals with force systems, friction, centroids and centers of gravity, moments of inertia.

As evidence of attaining the learning outcomes, the students are required to analyze collaboratively an assigned system such as trusses and use a computational algorithm or software in solving it. Prerequisites: Physics for Engineers (Lecture), Physics for Engineers (Laboratory)

GE103 **1 unit**
COMPUTER-AIDED DESIGN
The course covers the concepts of computer-aided drafting with introduction on CAD terminologies and environment with the application of techniques in inputting and executing CAD commands.

By the end of the course, students must be able to submit a portfolio of all their course works. Prerequisites: Engineering Drawing

GE104 **3 units**
FUNDAMENTALS OF MATERIALS SCIENCE AND ENGINEERING
This course introduces the students to a broad study on the structure and composition of materials (metals, polymers, ceramics, and composite materials) and their properties and behavior in service environments.

At the end of this course, the student must be able to select the appropriate material(s) for a given application.
Prerequisites: Organic Chemistry

GE105 3 UNITS ENVIRONMENTAL SCIENCE AND ENGINEERING
This course deals with ecological framework of sustainable development; pollution environments: water, air, and solid; waste treatment processes, disposal, and management; government laws, rules, and regulations related to the environment and waste management; and environmental management system.

As evidence of attaining the learning outcomes, the students are required to produce digital maps of ecosystems in Negros Occidental with the aid of GIS. This activity will help the students to be socially aware of what is happening to our ecosystems. This activity will also help develop the critical thinking and communication skills of the students as they will be orally presenting their findings.
Prerequisite: none

GE106 **3 units**
ENGINEERING ECONOMICS
The course involves the analysis and evaluation of factors for the economic success of engineering projects to ensure the best use of capital.

At the completion of the course, the students must be able to prepare collaboratively a depreciation and recovery plan for an assigned engineering project and prepare a paper presentation of their plan. Prerequisites: Engineering Data Analysis

GE107 **3 units**
ENGINEERING MANAGEMENT
This course will entail students to learn the basic function of a manager applicable in decision making which are applicable to the real world problems. Furthermore, students would learn how to apply planning, leading, organizing and control principles into the resources in order to increase the efficiency.

As evidence of attaining the learning outcomes, the students are required to submit a collaborative work on the strategic assessment of an assigned developmental project, focusing on the proposed product or service, the organization, project details, and the environment. It will culminate in the presentation of their assessment in class. Prerequisites: Engineering Economics

GE108 **3 units**
TECHNOPENEURSHIP 101
This course deals with concepts of technopreneurship with introspection of a business idea into a viable venture. The focus is on unleashing the entrepreneurial spirit of Engineering students.

At the end of this course, the student must be able to collaboratively present a business plan for a particular product or service and defend its viability which requires critical thinking and analysis. Prerequisite: 3rd Year Standing

CHM101E **4 units**
CHEMISTRY FOR ENGINEERS (Lecture)
This course provides students with core concepts of chemistry that are important in the practice of engineering profession.

As evidence of attaining the learning outcomes, the students are required to submit collaborative works on identifying chemical processes that occurs in the environment and how these processes affect us, give specific examples of the role of chemistry in energy generation, and find one specific application of chemistry in their specific field of specialization. Prerequisites: None
Co-requisites: Chemistry for Engineers Lab

CHM101EL **1 unit**
CHEMISTRY FOR ENGINEERS (Laboratory)
A fundamental laboratory course designed to relate and apply the principles and theories in chemistry to engineering practices. It is a combination of experimental and calculation laboratory.

At the end of the course, the students collaboratively must submit their experiment reports portfolio.
Prerequisites: None
Co-requisites: Chemistry for Engineers (Lecture)

PHY101E 4 units
PHYSICS FOR ENGINEERS (Lecture)
The course covers the following topics: Vectors; kinematics; dynamics; work, energy, and power; impulse and momentum; rotation; dynamics of rotation; elasticity; and oscillation.
Moreover, fluids; thermal expansion, thermal stress; heat transfer; calorimetry; waves; electrostatics; electricity; magnetism; optics; image formation by plane and curved mirrors; and image formation by thin lenses are covered as well.

As evidence of attaining the learning outcomes, the students are required to predict the outcomes of some actions or events, explain effectively why a certain phenomena occur, or how certain local and industrial issues are better addressed without compromising the environment and the welfare of the community. The activity will enhance the critical thinking skills of the students as well as improve both their written and oral communication skills since their output will be submitted and presented in class. Prerequisites: Calculus 1Co-requisites: Calculus 2; Physics for Engineers Lab

PHY101ELL 1 unit
PHYSICS FOR ENGINEERS (Laboratory)
A fundamental laboratory course designed to relate and apply the principles and theories of physics.

At the end of the course, the students collaboratively must be able to submit their experiment reports portfolio.
Prerequisites: Calculus 1
Co-requisites: Calculus 2; Physics for Engineers (Lecture)

CFP101
1 unit
COMPUTER FUNDAMENTALS AND PROGRAMMING
This course deals with basic information technology concepts, fundamentals of algorithm development, high-level language and programming applications, and computer solutions of engineering problems.

As evidence of attaining the learning outcomes, the students are required to submit collaborative works on utilizing the computer and any software applications as tools in providing solutions to engineering problems encountered in field of specialization.

CACHE 1 unit
COMPUTER APPLICATIONS IN CHEMICAL ENGINEERING
This course deals exposes the student to computational and simulation to software relevant to chemical engineering practice for engineering design, calculations and simulations.

After completing this course, the students must be able to use an application software to solve a chemical engineering problem as well as utilize mathematical and process simulation software in the design of unit operations and processes equipment. Prerequisite: Computer Fundamentals and Programming

BEE200 2 units
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
This course deals with the basic principles of electrical and electronics engineering of relevance to chemical engineers.

At the end of the course the students are required to collate data on monitoring the electrical energy consumption of the university using the basic electrical measuring instruments. This activity will develop the critical thinking of students and enable them to communicate effectively their findings through oral communications.
Prerequisite: Physics for Engineers (Lecture and Laboratory)
Co-requisite: Basic Electrical and Electronics Engineering (Laboratory)

BEE200 1 unit
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (LABORATORY)
This is a laboratory course to accompany Basic Electrical and Electronics Engineering.

At the end of the course, students will do assigned projects.
Prerequisites: Physics for Engineers (Lecture), Physics for Engineers Laboratory)
Co-requisite: Basic Electrical and Electronics Engineering (Lecture)

PCHEM101 2 units
PHYSICAL CHEMISTRY FOR ENGINEERS 1 (lecture)
The course deals with quantitative and theoretical study of the properties and structure of matter and their relation to the interaction of matter and energy. Specifically, it concerns with the study of the properties of gases and liquids, thermodynamics, phase equilibria and colligative properties of solutions.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and solved problem sets. Special problems that involved concets learned will be assigned and students are required to present their solution befitting a well-prepared technical report.
Prerequisite: Analytical chemistry, Calculus 2

PCHEM101 **1 units**
PHYSICAL CHEMISTRY FOR ENGINEERS 1 (laboratory)
This laboratory course accompanying Physical Chemistry 1 (lecture) covers the experiments concerning fundamental physical properties such as density, viscosity, melting point, surface tension; determination of optical properties by applying the principles of colorimetry/ turbidimetry, spectrophotometry, refractometry, and polarimetry. This course will also deal with important colligative properties, namely boiling point elevation and freezing point depression.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all their laboratory experiment reports. Moreover, the students must also report on the practical aspects of the experiments performed in relation to its impact in the community and the environment. Prerequisites: Analytical Chemistry, Calculus 2
Co-requisite: Physical Chemistry 1 Lecture

PCHEM102 **2 units**
PHYSICAL CHEMISTRY FOR ENGINEERS 2 (LECTURE)
The course is a continuation of Physical principles 1 starting with ternary liquid equilibrium with focus on liquid-liquid extraction and the application of Nernst Distribution law. The course covers chemical equilibrium, solutions of electrolytes and extension of equilibrium principles to electrochemistry. It also includes an introduction to chemical kinetics and colloidal chemistry. These topics provide a firm foundation for our understanding the physical principles that govern chemical systems.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and solved problem sets. Special problems that involved concets learned will be assigned and students are required to present their solution befitting a well-prepared technical report. Prerequisite: Physical Chemistry for Engineers 1

PCHEM102 **1 unit**
PHYSICAL CHEMISTRY FOR ENGINEERS 2 (LABORATORY)
The laboratory course accompanying Physical Chemistry 2 (lecture) is a continuation of Physical Chemistry 1 Laboratory which covers the experiments on chemical equilibria, phase equilibria, surface phenomena, thermochemistry, kinetics, and electrochemistry.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all their laboratory experiment reports. Moreover, the students must also report on the practical aspects of the experiments performed in relation to its impact in the community and the environment.
Prerequisites: Physical Chemistry 1 Laboratory
Co-requisite: Physical Chemistry 2 Lecture

ECHE101 **4 units**
ANALYTICAL CHEMISTRY (LECTURE)
A study of the theory and practice of gravimetric and volumetric methods of analysis, including an introduction to instrumental methods of analysis.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and solved problem sets.
Prerequisites: Chemistry for Engineers

ECHE101 **1 unit**
ANALYTICAL CHEMISTRY (LABORATORY)
A laboratory course that applies the principles and theories of gravimetric and volumetric methods of analysis of chemical samples, with an emphasis on laboratory techniques and accuracy of measurements.

As evidence of attaining the learning outcomes, the students are required to submit a collaborative work consisting of an experimental analysis plan of a particular chemical sample, and design a systematic process of collecting and interpreting the data obtained and how such data can be quantitatively analyzed.
Prerequisite: Chemistry for Engineers
Co-requisite: Analytical Chemistry (Lecture)

ECHE102 **3 units**
CHEMICAL ENGINEERING CALCULATIONS
A comprehensive study on the fundamentals and principles of material and energy balances associated with chemical engineering operations and processes.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and solved problem sets.
Prerequisite: Analytical Chemistry

ECHE103 **4 units**
ORGANIC CHEMISTRY (LECTURE)
This is a lecture course covering the nomenclature, occurrence, and preparation as well as the physical and chemical properties of organic compounds. It also includes an overview of the basic concepts of biochemistry.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and problem sets.
Prerequisite: Analytical Chemistry
Co-requisite: Organic Chemistry (Laboratory)

ECHE103 **1 unit**
ORGANIC CHEMISTRY (LABORATORY)
A 1-unit undergraduate organic chemistry laboratory course covering the determination of physical properties of organic compounds; separation and purification methods of organic mixtures; and qualitative organic analysis and synthesis. It is designed to provide the basic concepts and techniques involved in the determination of physical properties of organic

compounds, qualitative analysis of organic compounds, separation and purification of organic mixtures. The course will introduce chemical and instrumental methods for characterizing functional groups and their application to organic synthesis and preparation of derivatives. Concepts on Intermolecular Forces of Attraction, Properties and Reactions of Organic Compounds will be discussed alongside topics on Melting and Boiling Point Determination, Distillation, Recrystallization, Column Chromatography and Qualitative Analysis of Organic Compounds. Experiments which will illustrate each concept and topic will be performed by groups of students to allow thorough understanding and learning of the basic laboratory techniques in organic chemistry.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all their laboratory experiment reports.
Prerequisites: Analytical Chemistry (Lecture), Analytical Chemistry (Laboratory)
Co-requisite: Organic Chemistry (Lecture)

ECHE104 3 units
ADVANCED ENGINEERING MATHEMATICS IN CHEMICAL ENGINEERING
This course is a continuation of Differential Equations and is a combination of selected analytical and numerical methods of solutions to problems commonly encountered in chemical engineering. Laplace Transforms and Fourier Series are discussed as a tool in solving ordinary and partial differential equations analytically. Numerical Methods are applied in determining roots of non-linear equations, integration, differentiation and solutions of ordinary and partial differential equations. Knowledge of computer programming or the use of commercial softwares is essential to facilitate repetitive numerical calculations.

As evidence of attaining the learning outcomes, the students are required to submit a collaborative work which apply numerical methods for solving differential equations encountered in various physical and chemical engineering problems, and interpret the mathematical and physical consequences of the solution presented.
Prerequisite: Differential Equations

ECHE105 3 units
MOMENTUM TRANSFER
(2 units of lecture and 1 unit of computational lab equivalent to 3 hours)
This course is intended to provide chemical engineering students a solid foundation on transport phenomena specifically on fluid mechanics and momentum transfer. The course specifically deals with the basic principles of transport processes and the fundamental concepts of the two branches of fluid mechanics (statics and dynamics) which are important to chemical engineering unit operations. The combined mass, energy and momentum balances are applied in compressible or incompressible fluid flow. It also covers steady or unsteady flow and metering of fluid flow which are pertinent in the design of process equipment and piping networks.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and problem sets
Prerequisites: Differential Equations, ChE Calculations

ECHE106 3 units
CHEMICAL ENGINEERING THERMODYNAMICS
This course deals with the applications of the laws of thermodynamics to closed and open systems involving physical and chemical transformations of ideal and real fluids. Thermodynamic analysis of power and refrigeration cycles are also included.

As evidence of attaining the learning outcomes, the students are required to present an industrial problem relating the laws of thermodynamics and they will propose a doable solution for this problem. The objective of this activity is to develop the students' critical thinking and to make them aware of their social responsibility. The students will present their proposal in class.
Prerequisite: Physical Chemistry for Engineers; Chemical Engineering Calculations

ECHE107 4 units
HEAT AND MASS TRANSFER
(3 units of lecture and 1 unit of computational lab equivalent to 3 hours)
This course discusses the Fourier Heat Transport equation and its application of heat flow by conduction, convection and radiation. Heat transfer and process analysis are studied for heat exchangers, evaporators and crystallizers. The course also discusses the principles of mass transport and its application in unimolecular and equimolar counter diffusion as well as simultaneous heat and mass transfer processes. Equipment design for gas absorption, gas-liquid contact operations, drying and adsorption are covered.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and problem sets. Moreover, the students are required to perform mass and energy balances to a local industry in Negros. They will present their work in class. This activity will develop their critical thinking skills and enhance their communication skills.
Prerequisite: Momentum Transfer

ECHE108 1 unit
METHODS OF RESEARCH
This course deals with research preparation methods, research tools, research proposals, and the implementation, presentation and publication of research work.

After completing this course, the student must be able to look for and identify a research topic of interest, prepare and present a research proposal on the identified topic, design and conduct experiments, as well as to analyze and interpret data, understand professional and ethical responsibilities as they become familiar

with the design and conduct of experiments or other research activities and aware of research publication requirements, communicate effectively as they understand contemporary issues and the impact of engineering solutions in a global, economic, environmental and social context, and use techniques, skills and modern engineering tools needed in the chemical engineering practice.
Prerequisites: ChE Calculations, Physical Chemistry for Engineers 1, Purposive Communication, Engineering Data Analysis

ECHE109L **1 unit**
CHEMICAL ENGINEERING LABORATORY 1
A fundamental laboratory course in chemical engineering covering the applications of the theories of momentum transfer, heat transfer, evaporation, and solids handling and separation.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all their laboratory experiment reports.
Prerequisite: Momentum Transfer, Heat and Mass Transfer
Co-Requisite: Separation Processes

ECHE110 **3 units**
CHEMICAL PROCESS INDUSTRIES
This course is a survey of the different chemical process industries - their raw materials, processes, and products. Specifically, it deals with the unit processes and operations involved in selected chemical industries.

The students must design a technical research that shows the different unit processes and operations required to produce a new and usable product from locally available raw materials. The objective of this technical research output is to allow the students to develop their full potential in technical designing, translate the chemical engineering concepts in the design of the actual product and incorporate skills and values in the technical design of the new product which must be useful to the society. The students must effectively communicate their technical research design through oral defense.
Prerequisite: Organic Chemistry, Chemical Engineering Calculations

ECHE111 **4 units**
CHEMICAL REACTION ENGINEERING
This course introduces to undergraduate students the fundamentals of chemical reaction engineering, kinetics and their mathematical description, and the key operational and design aspects of reactors normally encountered in the chemical industry. It starts with the interpretation of batch reactor data followed by the design equations of the three ideal reactor types (batch, CSTR, plug flow). Reaction systems studied include liquid and gaseous homogeneous reactions, heterogeneous catalytic reactions, and temperature effects.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and problem sets. Moreover, as grouped, they will present a solution to a Chemical Reaction Engineering problem and report in class their proposed solution to the problem, showcasing how as future chemical engineers they can play a role in achieving sustainable development. Their work should present any of the following: how to improve an existing chemical process that converts raw materials to finished products, reduction of fuel consumption through better and efficient use of energy, maximize the use of valuable by-products, decrease the use of scarce natural resources or eliminate/reduce the release of harmful substances into the environment.
Prerequisites: Physical Chemistry for Engineers; Advanced Engineering Mathematics in Chemical Engineering; Heat and Mass Transfer

ECHE112 **3 units**
PARTICLE TECHNOLOGY
An introductory course on the science and technology of handling, treatment of particles and powders with emphasis on separation processes such as screening, sedimentation, centrifugation, and fluidization. Integrated in this course is the design of the different types of filtration equipment operated at constant pressure, constant rate or a combined constant pressure preceded by constant rate.

As evidence of attaining the learning outcomes, the students will present a research problem of particle emissions of an industry and they will propose a solution for this problem. This activity will develop the critical thinking skills and social awareness of students and enable them to communicate effectively their research through oral presentation.
Prerequisite: Momentum Transfer

ECHE113 **3 units**
SEPARATION PROCESSES
This course covers the application of principles of equilibrium to stagewise separation operations, multicomponent cascades and membrane separation processes.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and problem sets
Prerequisite: Heat and Mass Transfer, Solution Thermodynamics

ECHE114 **3 units**
SOLUTION THERMODYNAMICS
Thermodynamic properties of homogeneous mixtures. Phase & chemical reaction equilibria. Calculations involving models on homogeneous mixtures, phase and chemical reaction equilibria.

As evidence of attaining the learning outcomes, the students are required to present an industrial problem relating the laws of thermodynamics and they will propose a doable solution for this

problem. The objective of this activity is to develop the students' critical thinking and to make them aware of their social responsibility. The students will present their proposal in class.
Prerequisite: Chemical Engineering Thermodynamics, Advanced Engineering Mathematics in Chemical Engineering, Computer Applications in ChE

ECHE115 3 units
FOOD PROCESSING TECHNOLOGIES
Covers an overview of the different processes involved in food manufacture covering the handling and sourcing of raw materials, process parameters, manning requirements, finished products handling and limitations inherent to each type of food product. It includes meat processing, canned goods, baked products, diary products and all types of beverages. It also includes plant visits to enhance learning.

As evidence of attaining the learning outcomes the students are required to make a technical study on food production from a locally available raw material using their knowledge in the proper handling of raw materials, goods-in-process and finished products. This activity will develop the critical thinking and social awareness of the students and enable them to communicate effectively their technical study plan through oral presentation.

ECHE116 3 units
BIOCHEMICAL ENGINEERING
The course deals with the processing of biological materials and processing of biological agents such as cells and enzymes. It focuses on the kinetics of biological reactions and the design of reactor for biochemical engineering applications.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes and problem sets
Prerequisites: Chemical Reaction Engineering; Organic Chemistry

ECHE117 1 unit
PROCESS SAFETY
The course covers all the aspects of safety in relation to the industrial field including government regulations and audit, and inspection standards that will familiarize the student on the various aspects of safety in the industrial arena.

As evidence of attaining the learning outcomes, the students are required to interpret, discern and critique assigned situations (case study) in accordance with the process safety standards.
Prerequisite: 4th Year standing

ECHE 118 3 units
ENVIRONMENTAL IMPACT ASSESSMENT
Deals with procedures and methodology of conducting environmental impact assessment of projects. Special attention is given to the development of skills of the student for genuine public participation and involvement.

The students will be required to make an initial environmental examination (IEE) of a certain small scale industry here in Negros. This activity will develop the critical thinking and social awareness of the students and enable them to communicate effectively their IEE through oral presentation.
Prerequisite: Environmental Science and Engineering

ECHE119 3 units
CHEMICAL ENGINEERING DESIGN 2
This is the capstone course which utilizes the fundamentals of chemical engineering in the design of a chemical plant. It includes the synthesis of process flow sheets, analysis of process conditions and the analytic, heuristic and optimum design of equipment and processes. Economic analysis is included to estimate the cost of equipment, capital investment, total product cost and profitability.

As evidence of attaining the learning outcomes, the students are required to submit a collaborative work that will include the essential elements of plant design in the development of a plant
design project, use engineering economics to evaluate plant profitability, apply analytic and heuristic techniques in equipment design, use software and simulation techniques to design equipment and processes and to analyze their performance, analyze and improve the performance of equipment and processes by incorporating technical standards, ethics, health, safety, and environmental issues, model a Plant Design Project, and develop oral and written communication skills, and work as a member of a design team.
Prerequisites: Chemical Engineering Design 1; Engineering Economy; Process Dynamics and Control

ECHE120 3 units
INDUSTRIAL WASTE MANAGEMENT AND CONTROL
The course deals with a variety of physical, chemical, biological treatment processes applied to industrial wastewater treatment, air pollution control, solid waste disposal and waste-to-energy conversion in compliance with national regulatory frameworks. Stream and air dispersion models will also be discussed. The main concepts of pollution prevention are emphasized in environmental management systems, environmental impact assessments, risk assessment and life cycle analysis.

As evidence of attaining the learning outcomes, the students are required to submit a collaborative work involving the design of a wastewater treatment plant / air pollution control / solid waste disposal scheme for an industrial facility.
Prerequisite: Particulate Technology, Environmental Science

ECHE121 **1 unit**
PLANT INSPECTIONS AND SEMINARS
This course deals with a series of lectures and seminars on selected topics that are highly relevant to chemical engineering but are not covered in any of the other formal courses. It covers recent advances in chemical engineering. Visits to industrial plants are also conducted during the term.

By the end of the course, the students must be able to organize seminars and plant visits relevant to chemical engineering, have a first-hand observation on the conduct of industrial processes through plant visits, explain unit operations and unit processes used in the plants visited, and develop a sense of responsibility in fulfilling assigned tasks particularly in organizing seminars and plant visits. Moreover, they are required to submit written reports on all the aforementioned undertakings.
Prerequisites/co-requisites: Chemical Reaction Engineering; Heat and Mass Transfer

ECHE122 **3 units**
PROCESS DYNAMICS AND CONTROL (LECTURE AND LABORATORY)
A lecture and laboratory course that combines the mathematical, physical and chemical concepts for application to process simulation and control. Whenever appropriate, process simulation or programming software is used to demonstrate the behavior of the control system.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the seatworks, quizzes, problem sets and written reports of the experiments conducted.
Prerequisites: Advanced Engineering Math in ChE

ECHE123 **3 units**
SOLID WASTE MANAGEMENT
Covers the integrated management of municipal solid waste: waste generation, reduction, storage, collection, transportation, transfer station, recycling and resource recovery, materials recovery facility and management options and engineering principles in the various disposal treatment methods. Design of landfill, composting facility and incineration plant are included in the course. Regulations and policies relevant to solid waste management, technical considerations in the development of engineering design will be addressed.

The students are required to plan and design programs for an integrated municipal waste management system for a certain barangay here in Bacolod. This activity will develop the critical thinking and social awareness of the students and enable them to communicate effectively their design plan through oral presentation.
Prerequisite: Environmental Impact Assessment

CPL101L **1 unit**
CHEMICAL PROCESS LABORATORY
This is a laboratory course that involves actual preparation of industrial products commonly encountered in the chemical process industries such as manufacture of vegetable oil, refined vegetable oil, soap, wine, refined sugar, paper etc. and introduce concepts of product development and innovation.

As evidence of attaining the learning outcomes, the students as grouped are required to submit a portfolio of all the written reports of the experiments conducted.
Prerequisite: Organic Chemistry Lecture; Organic Chemistry Laboratory

CED101L **1 unit**
CHEMICAL ENGINEERING LABORATORY 2
This laboratory course is a continuation of Chemical Engineering Laboratory I. It covers mainly laboratory experiments in Mass Transfer Operations such as diffusion, distillation, humidification, drying etc. Experiments in Reaction Kinetics using a continuous stirred tank reactor (CSTR) and a plug flow tubular reactor are also included in this laboratory course. This course is a continuation of Chemical Engineering Laboratory I. The course covers mainly experimental studies in mass transfer operations such as diffusion, distillation, humidification, drying, and experiments in kinetics and catalysis using pilot plant equipment.

As evidence of attaining the learning outcomes, the students are required to submit a portfolio of all the written reports of the experiments conducted.
Prerequisite: Chemical Engineering Laboratory 1

CED101 **2 units**
CHEMICAL ENGINEERING DESIGN 1
This course is expected to complement the Plant Design course in the preparation of the design project. It includes equipment design in industrial plants, with emphasis on short-cut methods; piping system, pumps, pressure vessels, mass and heat transfer equipment, materials handling and using multiple constraints and applying engineering standards and codes appropriate for chemical engineering.

As evidence of attaining the learning outcomes, the students are required to calculate analytically using the principles of mass, heat and momentum transfer, the different equipment design parameters of equipments to be designed, apply the principles of equipment design to the plant design project, and work as a team in the equipment design related to the plant design project
Prerequisite: Separation Processes; Chemical Reaction Engineering; Particle Technology
Co-Requisite: Process Safety44

CLE101 **1 unit**
CHEMICAL ENGINEERING LAWS AND ETHICS
The course covers relevant national laws and ethical standards on the professional practice of chemical engineering in the Philippines, project contracting and implementation, environment and safety, investments and setting of enterprises in the Philippines.

As evidence of attaining the learning outcomes, the students are required to interpret, discern and critique assigned situations (case study) in accordance with their ethical and moral obligations in the conduct of their profession.
Prerequisite: Ethics

CHEMIM **2 units**
CHEMICAL ENGINEERING IMMERSION
Actual On-the-Job Training or Industry Internship in the field of specialization.

As evidence of attaining the learning outcomes, the students are required to submit technical reports relating theories learned in school to the actual technical and/or practical solutions to industrial problems. This will make the students develop their critical thinking in giving practical solutions to industrial problems.
Prerequisites: 4th Year Standing

EIA1C **1 unit**
ENGINEERING INTENSIVE APPRAISAL FOR CHE 1
This is a 1 unit dry lab course that includes the review of all general engineering mathematics.
At the end of the course, the students are required to pass the comprehensive examination.

EIA2C **1 unit**
ENGINEERING INTENSIVE APPRAISAL FOR CHE 2
This is a 1 unit dry lab course that includes the review of all general engineering sciences.