Bachelor of Science
in Materials Engineering
(BSMatE)

Program Description

Bachelor of Science in Materials Engineering is a field of study which deals with the synthesis and use of both fundamental and empirical knowledge about materials in particular, how the properties of a material are related to composition, structure, and processing in order to develop, prepare, modify, and apply them to specific needs. Materials Engineering provides the tools necessary to improve the properties, processing, and performance of materials such as polymers, ceramics, semiconductors, metals, and composites for a wide variety of applications. Such innovations pave way for technological progress in the country.

Program Educational Objectives

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

1. Successful career in materials engineering and /or related fields, and be prepared to pursue a broad range of materials-related career and graduate school opportunities.
2. Utilize his/her knowledge in materials engineering and effectively contribute to address contemporary materials 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 Materials Engineering as well as community-based organizations.

Program Outcomes

By the time of graduation, the students of the program shall have the ability to:

a. Apply knowledge of mathematics and science to solve complex materials engineering problems in real life application using technology and innovative methods.
b. Design and conduct experiments in materials engineering as well as analyse and interpret experimental data, and be able to identify relevant information and engage in discovering of new knowledge and synthesize and evaluates information to derive valid conclusions.
c. Design a system, component, or process using appropriate technologies to meet desired needs within realistic constraints such as economic, environmental, social political, ethical, health and safety, manufacturability and sustainability in accordance with standards and be accountable for actions which are a result of a well-discerned choices.
d. Function in multidisciplinary, on multifaceted and/or multi-cultural teams fostering a better interpersonal relations.
e. Identify and formulate and solve complex materials engineering problems with comprehensive application on synthesis and characterization methods of materials using current technology and innovative methods.
f. Understand professional and ethical responsibility of the profession to arrive at

well-discerned decisions and choices.

g. Communicate effectively, orally as well as in writing, expresses oneself effectively and confidently using appropriate media with the community and society at large.
h. Understand the impact of materials engineering solutions in global, economic, environmental, and societal context arriving at a well-discerned decisions.
i. Pursue life-long learning in the context of innovation, research, and technological developments.
j. Apply reasoning informed by contextual knowledge to assess contemporary issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
k. Use techniques and skills in processing materials engineering problems with the use of modern tools and technology.
l. Demonstrate management skills and apply engineering principles to one's own work, and confidently express him/herself as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

Admission Requirements

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

Retention Policies

A student will be permanently dismissed from the MatE program due to any of the following reasons:

1. If he/she incurs a total of 30 units of failures.
2. If a student incurs 18 units of failure in one semester.

BACHELOR OF SCIENCE
Materials Engineering

FIRST YEAR

First Semester		**Total Credit**	**No. of hrs Lec**	**Lab**	**Total Assessed Units**	**Pre-requisite**	**Co-requisite**
EMA100	Algebra and Trigonometry	3	2	3	5		
EMA101	Calculus 1	4	4	0	4		EMA100-Algebra and Trigono-metry
CHM101E	Chemistry for Engineers (Lec)	4	4	0	4	none	
CHM101EL	Chemistry for Engineers (Lab)	1	0	3	3		CHM101E
GE 101A	Computer-Aided Drawing and Drafting	2	0	6	6	none	
EMat 101	Materials Engineering as a	2	2	0	2	none	
MATHMW	Mathematics for Modern World	3	3	0	3	none	
NSTP1	National Service Training Program	3	3	0	3	none	
PED1	Physical Education 1 (Wellness and Fitness)	2	2	0	2	none	
IRS1	Lasallian Spirituality	3	3	0	3	none	
IGG	Group Guidance	1.5	1.5	0	1.5	none	
	Total	**28.5**	**24.5**	**12**	**36.5**		

Second Semester		**Total Credit**	**No. of hrs Lec**	**Lab**	**Total Assessed Units**	**Pre-requisite**	**Co-requisite**
CHM102E	Analytical Chemistry (Lecture)	3	3	0	3	CHM101E-Chemistry for Engineers	
CHM102EL	Analytical Chemistry	2	0	6	6		CHM102E-Analytical Chemistry (lec)
EMA102	Calculus 2	4	4	0	4	EMA101-Calculus 1	
NSTP2	NSTP 2	3	3	0	3	NSTP 1	
PED2	Physical Education 2 (Team Sports and Rhythmic Activities)	2	2	0	2	PED1	
PHY101E	Physics for Engineers (Lec)	4	4	0	4	EMA101-Calculus 1	
PHY101EL	Physics for Engineers (Lab)	1	0	3	3		PHY101E-Physics for Engineers (lec)
PCOM	Purposive Communication	3	3	0	3	none	
EMat 102	Structure-Property Relationships in Materials 1	3	3	0	3	CHM101E-Chemistry for Engineers	
IRS2	Christian Morality	3	3	0	3	IRS1-Lasallian Spiritality	
	Total	**28**	**25**	**9**	**34**		

SECOND YEAR

First Semester		**Total Credit Units**	**No. of hrs Lec**	**Lab**	**Total Assessed Units**	**Pre-requisite**	**Co-requisite**
EMat 103	Analytical Techniques in Engineering (lecture)	3	3	0	3	CHM102E-Analytical Chem (lec)	
EMat 103L	Analytical Techniques in Engineering (laboratory)	1	0	3	3		EMat103-Analytical Techniques in Materials Engineering (lecture)
EMA104	Engineering Data Analysis	3	3	0	3	none	
EMat 104	Solid State Engineering	3	3	0	3	EMat102-Structure-Property Relationships in Materials Engineering 1	
PED3	Physical Education 3 (Swimming and Recreation)	2	2	0	2	PED1	
GE 110	Statics of Rigid Bodies	3	3	0	3	PHY101E-Physics for Engineers (Lec), EMA102, Calculus 2	
EMat 105	Structure-Property Relationships in Materials 2	3	3	0	3	EMat102-Structure-Property Relationships in Materials Engineering 1	
EMat 106	Thermodynamics of Materials	3	3	0	3	CHM101E-CHEMISTRY FOR ENGINEERS	
LOGIC	LOGIC	3	3	0	3	none	
	Total	**24**	**23**	**3**	**26**		

Second Semester		**Total Credit Units**	**No. of hrs Lec**	**Lab**	**Total Assessed Units**	**Pre-requisite**	**Co-requisite**
EMat 107	Computer Applications in Engineering	2	0	6	6	2nd Year Standing	
EMA103	Differential Equations	3	3	0	3	EMA102-Calculus 2	
GE 111	Dynamics of Rigid Bodies	2	2	0	2	GE110-Statics of Rigid Bodies	
GE 105	Environmental Science and Engineering (w/ safety and GIS)	3	3	0	3	CHM101E-CHEMISTRY FOR ENGINEERS	
EMat 108	Kinetics of Materials and Processes	3	3	0	3	EMat106	

						-Thermodynamics of Materials
CHM103E	Organic Chemistry (lecture)	3	3	0	3	CHM102E-Analytical Chem (lec)
CHM103EL	Organic Chemistry (laboratory)	1	0	3	3	CHM103E-Organic Chemistry (lecture)
PED4	Physical Education 4 (Individual and Dual Sports)	2	2	0	2	PED1
PSPEAK	Public Speaking	3	3	0	3	none
USELF	Understanding the Self	3	3	0	3	none
	Total	**25**	**22**	**9**	**31**	

THIRD YEAR

First Semester		**Total Credit**	**No. of hrs Lec**	**Lab**	**Total Assessed Units**	**Pre-requisite**	**Co-**
GE 106	Engineering Economics	3	3	0	3	3rd Year Standing	
BEE 301	Basic Electrical Engineering	3	3	0	3	PHY101E-Physics for Engineers (lec)	
GE 112	Mechanics of Deformable Bodies	3	3	0	3	GE110-Statics of Rigid Bodies	
EMat 109	Thermodynamics and Kinetics	1	0	3	3	EMat108-Kinetics of Materials and Processes	
EMat 110	Polymer Materials (lecture)	3	3	0	3	EMat105-Structure-Property Relationships in Materials 2	
EMat 110L	Polymer Materials (laboratory)	1	0	3	3		EMat110-Polymer Materials (lecture)
EMat 111	Synthesis and Processing of Materials	3	3	0	3	EMat108-Kinetics of Materials and Processes, GE112-Mechanics of Deformable Bodies	
EMat 112	Design and Analysis of in Materials Engineering	3	3	0	3	MATHMW-Mathematics for Modern World	
LITE	Living in the IT Era	3	3	0	3		
	Total	**23**	**21**	**6**	**27**		

Second Semester		Total Credit	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
EMat 113	Degradation of Materials (lecture)	3	3	0	3	EMat105-Structure-Property Relationships in Materials 2	
EMat 113L	Degradation of Materials (laboratory)	1	0	3	3		EMat113-Degradation of Materials (lecture)
EMat 114	Composite Materials (lecture)	3	3	0	3	EMat105-Structure-Property Relationships in Materials 2	
EMat 114L	Composite Materials (laboratory)	1	0	3	3		EMat114-Composite Materials (lecture)
EMat 115	Materials Selection and Plant Design (lecture)	3	3	0	3	EMat105-Structure-Property Relationships in Materials 2, GE112-Mechanics of Deformable Bodies	
EMat 115L	Materials Selection and Plant Design (laboratory)	1	0	3	3		EMat115-Mateials Selection and Plant Design (lecture)
GE 113	Mechanics of Fluids	2	2	0	2	GE111-Dynamics of Rigid Bodies	
IRS3	Spirituality in the Workplace	3	3	0	3	IRS2-Christian Morality	
GE 108	Technopreneurship 101	3	3	0	3	3rd Standing	
GBOOKS	GEC Elective 2 (GREAT BOOKS)	3	3	0	3	none	
CWRLD	The Contemporary World	3	3	0	3	none	
	Total	**26**	**23**	**9**	**32**		

Summer		Total Credit	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
EMat 116	On the Job Training	2	0	240	2	3rd Year Standing	
	Total	**2**	**0**	**240**	**2**		

FOURTH YEAR

First Semester		Total Credit	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
ARTAP	Art Appreciation	3	3	0	3	none	
GE 107	Engineering Management	2	2	0	2	GE106-Engineering Economics	
ETHICS	Ethics	3	3	0	3		
EMat 117	Forensic Engineering	3	3	0	3	EMat113-Degradation of Materials	
EMat 118	Laws, Ethics, Seminars and Plant Visit (with Safety)	1	0	3	3	4th Year Standing	
RIZAL	Life and Works of Rizal	3	3	0	3	none	
EMat1R	Methods of Research	3	3	0	3	4th Year Standing	
	Total	**18**	**17**	**3**	**20**		

Second Semester		Total Credit	No. of hrs Lec	Lab	Total Assessed Units	Pre-requisite	Co-requisite
EMat 119	Materials Research Project (or Undergraduate Thesis)	2	0	6	6	EMat112-Design and Analysis of Experiments in Materials Engineering	
EMat 120	Special Materials (Special Topics)	3	3	0	3	EMat105-Structure-Property Relationships Material 2	
RHIST	Readings in Philippine History	3	3	0	3	none	
EMat 121	Quality Assurance	3	3	0	3	EMA104-Engineering Data Analysis	
STS	Science, Technology and Society	3	3	0	3	3rd Year Standing	
GENSOC	Gender and Society	3	3	0	3	none	
	Total	**17**	**15**	**6**	**21**		

University of St. La Salle
BACOLOD

SUMMARY OF REQUIRED COURSES

BS Materials Engineering

	No. of Total Units	Courses Required	Unit Equivalent
Technical Course			
Mathematics			
Algebra/Trigonometry	1	3	
Calculus 1 – 2	2	8	
Differential Equation	1	3	
Engineering Data Analysis	1	3	17
Natural/Physical			
Chemistry for Engineers	2	5	
Physics for Engineers	2	5	10
Basic Engineering Sciences			
Computer-Aided Drawing & Drafting	1	2	
Statics Rigid Bodies	1	3	
Dynamics of Rigid Bodies	1	3	
Mechanics of deformable bodies	1	3	
Mechanics of fluids	1	2	
Engineering Economics	1	3	
Engineering Management	1	2	
Environmental Science	1	3	
Technopreneurship	1	3	23
Allied			
Basic Electrical Engineering	1	3	
Analytical Chemistry	2	5	
Organic Chemistry	2	4	12
Professional			
Computer applications in Materials Engineering	1	2	
Materials Engineering as a Profession	1	2	
Structure-Property Relationships in Materials 1	1	3	
Structure-Property Relationships in Materials 2	1	3	
Thermodynamics of Materials	1	3	
Kinetics of Materials & Processes	1	3	
Thermodynamics and Kinetics Laboratory	1	1	
Synthesis and Processing of Materials	1	3	
Analytical Techniques in Materials Engineering	2	4	
Solid state Engineering	1	3	
Polymer Materials (Materials Elective 1)	2	4	
Composite Materials (Materials Elective 2)	2	4	
Quality Assurance	1	3	
Degradation of Materials	2	4	
Methods of Research	1	3	
Materials Selection and Plant Design	2	4	
Forensic Engineering/ Failure Analysis	1	3	
Design and Analysis of Experiments 1	3		
Special Materials	1	3	
Materials Research Project (Undergraduate thesis)	1	2	
Laws, Ethics, Seminars & Plant visits	1	1	
On-the-Job Training	1	2	63
Non–Technical Courses			
General Education			
Art Appreciation	1	3	
Ethics	1	3	
Mathematics for Modern World	1	3	
Purposive Communication	1	3	
Readings in Philippine History	1	3	
Science, Technology and Society	1	3	

The Contemporary World	1	3	
Understanding the Self	1	3	24
General Education Course Electives/Mandated			
Life in the IT Era	1	3	
Gender and Society	1	3	
Great Books	1	3	
Life and Works of Rizal	1	3	12
Physical Education			
Physical Education 1 – 4	4	8	8
National Service Training Program			
National Service Training Program 1 – 2	2	6	6
Institutional			
Group Guidance	1	1.5	
Logic	1	3	
Public Speaking	1	3	
Religion Studies	3	9	16.5
Total	**74**		**191.5**

MAJOR COURSE DESCRIPTIONS Bachelor of Science in Materials Engineering

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.

Prerequisite:
None

EMA101 4 units
DIFFERENTIAL CALCULUS
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 normal, and approximations; partial differentiation and transcendental curve tracing.

At the end of this course, the student must be able 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.
Prerequisite:
None

EMA102 4 units
INTEGRAL CALCULUS
The course introduces the concepts 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.

At the end of this course, the student must be able 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 utilizing integral to solve conceptual and real-world problems.
Prerequisite: EMA101- Differential Calculus

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.

The students are expected to be able to recognize different kinds of differential equations, determine the existence and uniqueness of solution, select the appropriate methods of solution and interpret the obtained solution. Students are also expected to relate differential equations to various practical engineering scientific problems as well as employ computer technology in solving and verifying solutions. At the end of this course, the student must be able 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. Prerequisite: EMA102- Integral Calculus

EMA104 4 units
ENGINEERING DATA ANALYSIS
This course deals with basic principles of statistics; presentation and analysis of data; averages, median, mode; deviations; probability distributions; normal curves and applications; regression analysis and correlation; application to engineering problems.

At the end of this course, the student must be able to apply accurately statistical knowledge in solving specific engineering problem situations.
Prerequisite: EMA101- Differential Calculus

GE 101A 2 units
COMPUTER-AIDED DRAWING AND DRAFTING
This course deals with the concepts of computer- aided drafting (CAD); introduction to the CAD environment; terminologies; and the general operating procedures and techniques in entering and executing basic CAD commands. Practices and techniques of graphical communication; application of drafting instruments, lettering scale, and units of measure; descriptive geometry; orthographic projections; auxiliary views; dimensioning; sectional views; pictorial drawings; requirements of engineering working drawings; and assembly and exploded detailed drawings.

At the end of this course, the student must be able to prepare engineering drawings of 2D figures of materials using CAD.
Prerequisite:
None

GE 105 3 units
ENVIRONMENTAL SCIENCE AND ENGINEERING (W/ SAFETY
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.

At the end of this course, the student must be able 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: CHM101E-Chemistry for Engineers

GE 106 3 units
ENGINEERING ECONOMICS
This course deals concepts of the time value of money and equivalence; basic economy study methods; cost estimation; overview of feasibility study preparation; decisions under certainty; decisions recognizing risk; and decisions admitting uncertainty. Applications to materials engineering.

At the end of this course, the student must be able to evaluate project alternatives by applying engineering economic principles and methods and select the most economically efficient one. Prerequisite: 3rd year standing

GE 107 2 units
ENGINEERING MANAGEMENT
This course deals with decision-making; the functions of management; managing production and service operations; managing the marketing function.

At the end of this course, the student must be able to create a project plan given a case scenario/study applying the different functions of management. Prerequisite: GE 106- Engineering Economics

GE 108 3-units
TECHNOPRENEURSHIP 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 present a business plan and defend which requires critical thinking and analysis and relate the significance of technopreneurship in the socio- economic development of the country. Prerequisite: 3rd year standing

GE 110 **3 units**
STATICS OF RIGID BODIES
This course deals with force systems; structure analyses; friction; centroids and centers of gravity; and moments of inertia.

At the end of this course, the student must be able to design a report on the stresses of trusses, beams, and frames of one structure here in the University. Prerequisites: PHY101E- Physics for Engineers and EMA102- Integral calculus

GE 111 **2 units**
DYNAMICS OF RIGID BODIES
This course deals with kinetics and kinematics of a particle; kinetics and kinematics of rigid bodies; work energy method; and impulse and momentum (linear and rotational).

At the end of this course, the student must be able to solve problem sets applying the principles governing the motion of particles, velocity and acceleration, principles of Newton's Second Law, kinetics of particles in particular energy and momentum methods, kinematics of rigid bodies, its energy and momentum.
Prerequisite: GE 110-Statics of Rigid Bodies

GE 112 **3 units**
MECHANICS OF DEFORMABLE BODIES
This course deals with axial stress and strain; Mohr's circle; stresses for torsion and bending; combined stresses; beam deflections; indeterminate beams; and elastic instability.

At the end of this course, the student must be able to prepare a report on the elastic stability of columns in the Engineering and Technology building.
Prerequisite: GE 111-Statics of Rigid Bodies

GE 113 **2 units**
MECHANICS OF FLUIDS
This course deals with properties of fluids. Fluid statics and kinematics. Forces, energy and momentum in fluid flow. Fluid flow in open and closed channels. Fluid measurements.

At the end of this course, the student must be able to solve problem sets in fluid mechanics especially those relevant to Materials engineering, Prerequisite: GE 111-Dynamics of Rigid Bodies

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

At the end of this course, the student must be able 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 Prerequisite: None

CHM101EL **1 unit**
CHEMISTRY FOR ENGINEERS LABORATORY A 1-unit 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 this course, the student must be able to perform experiments in Physics and write reports about the activity. State experimental observation, interpret results clearly obtained from mechanics of alpha, beta and gamma decay as well as the correlation between half- lives, understand the natural environment and its relationships with human activities, and design and evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.
Co-requisite: CHM101E- Chemistry for Engineers

CHM102E **3 units**
ANALYTICAL CHEMISTRY
This course deals with principles and techniques of analysis with emphasis on volumetric methods and stoichiometry. Gravimetric, colorimetric and potentiometric methods. Survey of common instrumental methods. Analysis of substances and simple mixtures.

At the end of this course, the student must be able to make a report on the common instrumental methods for chemical analysis of substances and mixtures.
Prerequisite: CHM101E-Chemistry for Engineers

CHM102EL **2 units**
ANALYTICAL CHEMISTRY LABORATORY
This course deals with techniques, methods, and instrumentation involved in determining the amounts or concentrations of constituents in samples.

At the end of this course, the student must be able to perform and interpret results clearly obtained from the experiments, answer questions related to the performed experiment, and develop critical and technical communication skills.
Co-requisite: CHM102E- Analytical Chemistry

CHM103E **3 units**
ORGANIC CHEMISTRY
This course deals with nomenclature, occurrence, and preparation as well as the physical and chemical properties of organic compounds. Overview of the basic concepts of biochemistry.

At the end of this course, the student must be able to name various organic molecules and species and describe physical and chemical properties of organic compounds.
Prerequisite: CHM102E-Analytical Chemistry

CHM103EL
1 unit
ORGANIC CHEMISTRY LABORATORY
A 1-unit laboratory course that provides systematic study of the theories, principles, and techniques of Organic Chemistry.

At the end of this course, the student must be able to:erform experiments in organic chemistry and write reports about the activity. Relate and apply the concept of Organic Chemistry to real- life situations.
Co-requisite: CHM103E- Organic Chemistry

PHY101E 4 units
PHYSICS FOR ENGINEERS
This course deals with vectors; kinematics; dynamics; work, energy, and power; impulse and momentum; rotation; dynamics of rotation; elasticity; and oscillation; 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.

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.
Co-requisite: EMA101- Differential Calculus

PHY101EL
1 unit
PHYSICS FOR ENGINEERS LABORATORY
A 1-unit laboratory course in Physics that covers experiments on vectors; kinematics; dynamics; image formation by plane and curved mirrors; and image formation by thin lenses. It aims to provide students with strong understanding of the underlying principles and develop their critical thinking capabilitites.

At the end of this course, the student must be able to perform experiments in Physics and write reports about the activity. State experimental observation, interpret results clearly obtained from the work, energy, and power; impulse and momentum; rotation; dynamics of rotation; elasticity; and oscillation; fluids; thermal expansion, thermal stress; heat transfer; calorimetry; waves; electrostatics; electricity; magnetism; optics; experiments, and answer questions related to the performed experiment.
Co-requisite: PHY101E- Physics for Engineers

BEE 301 3 units
BASIC ELECTRICAL ENGINEERING
This course deals with fundamentals of electric and magnetic circuits. Direct and alternating current machinery. Elementary distribution systems and electrical wiring.

At the end of this course, the student must be able to design a simple power supply in order to develop the skills in soldering.
Prerequisite: PHY101E- Physics for Engineers

EMat 101 2 units MATERIALS ENGINEERING AS A PROFESSION
This course is the introduction to the practice of materials engineering as a profession designed to expose students to the various applications of the field and its major impact on important technology developments. Career opportunities in materials engineering.

At the end of this course, the student must be able to conduct a Christian Service Learning Program (CSLP) in a given community and will demonstrate knowledge of milestones in technological development where critical materials played a role.
Prerequisite:
None

EMat 102 3 units STRUCTURE-PROPERTY RELATIONSHIPS IN MATERIALS 1
This course deal with the structure and composition of materials; properties and behavior of important metals, polymers, ceramics and composites in service environments; indigenous raw material sources of engineering materials.

At the end of this course, the student must be able to select the appropriate material(s) for a given application. Evaluate feasibility of designs based on material considerations.
Prerequisite: CHM101E-Chemistry for Engineers

EMat 103 3 units ANALYTICAL TECHNIQUES IN MATERIALS ENGINEERING
This course deals with analytical methods for materials characterization including data acquisition and calculations involved in techniques such as thermal analysis, x-ray diffraction, imaging, spectroscopy, etc.; sample preparation, equipment conditioning and detection limits, etc..

At the end of this course, the student must be able to make a report that describes a typical analytical techniques for materials characterization, enumerate the advantages and disadvantages, and applications and limitations of the different analytical techniques.
Prerequisite: CHM102E-Analytical Chem (lec)

EMat 103L 1 unit ANALYTICAL TECHNIQUES IN MATERIALS ENGINEERING (LABORATORY)
Is a 1-unit laboratory course that deals with the techniques, methods, instrumentation and analysis involved in determining the concentrations of constituents in a sample and materials characterization.

At the end of this course, the student must be able to follow standard procedures for performing selected analytical techniques via laboratory experiments.
Co-requisite: EMat 103-Analytical Techniques in Materials Engineering (lecture)

EMat 104 3 units
SOLID STATE ENGINEERING
This course deals with electrical and magnetic materials and their properties; band theory of solids and lattice vibrations; periodic structures; lattice waves; electron states; static properties of solids; electron-electron interactions; dynamics of electrons in solids.

At the end of this course, the student must be able to present through oral reporting the applications of semiconductors in devices for a wide variety of use, and describe techniques to characterize electronic materials.
Prerequisite: EMat 102- Structure-Property Relationships in Materials 1

EMat 105 3 units STRUCTURE-PROPERTY RELATIONSHIPS IN MATERIALS 2
This course deals with more advanced concepts on the origin, mechanism of development and control of internal structure of materials. Phase transformations and heat treatment principles and practice. Deformation and failure of materials (fatigue, creep, stress corrosion). Strengthening mechanisms. Plastic deformation processing, tools and equipment (e.g. forging, rolling, extrusion, drawing, forming and machining).

At the end of this course, the student must be able to design properly casting, rising and gating systems by implementing knowledge on metal solidification behaviors and patterns, and discuss different powder metallurgy and metal joining techniques.
Prerequisite: EMat 102- Structure-Property Relationships in Materials 1

EMat 106 3 units
THERMODYNAMICS OF MATERIALS
This course deals with basic thermodynamic quantities and laws; phase transformations and chemical reactions; partial molal and excess quantities; phase of variable compositions; free energy of binary systems, surfaces and interfaces.

At the end of this course, the student must be able to present their research output on relationship of the thermodynamic properties, the phase transformation, and the properties of materials. Prerequisite: CHM101E-Chemistry for Engineers

EMat 107 2 units COMPUTER APPLICATIONS IN MATERIALS Engineering
This course deals with basic information technology concepts; fundamentals of algorithm development; high-level language and programming applications; computer solutions of problems in materials engineering.

to perform the C++ programming language to solve various Material Engineering problems, effectively use the MATLAB software in solving linear and non- linear algebraic equations, differential equations, and systems of differential equations, and learn the importance of problem analysis.
Prerequisite: 2nd year standing

EMat 108 3 units
KINETICS OF MATERIALS AND PROCESSES This course deals with reaction rates, mechanisms and transport phenomena in materials from a phenomenological and atomistic point of view (diffusion). Applications to nucleation, crystal growth, grain growth, recrystallization, precipitation, phase transformations. Role of kinetics in the development of microstructures.

At the end of this course, the student must be able to come up with a research paper on the kinetics involve to control different materials engineering processes. Prerequisite: EMat 102-Thermodynamics of Materials

EMat 109
1 unit
THERMODYNAMICS AND KINETICS LAB
This course deals with demonstrative applications of thermodynamic and kinetic principles relevant to materials engineering; determination of kinetic parameters; investigation of surface thermodynamic properties; thermal analysis of bulk materials.

At the end of this course, the student must be able to conduct experiments that will demonstrate thermodynamic and kinetic principles, analyze the data measured and make valid conclusions from the results.
Prerequisite: EMat 108- Kinetics of Materials & Processes

EMat 110 3 units
POLYMER MATERIALS (LECTURE)
This course deals with composition, structure and properties of major groups of polymer materials. Synthesis and processing, and Applications.

At the end of this course, the student must be able to discuss through group presentation the recent advances in Polymer Science and Engineering.
Prerequisite: EMat 105- Structure-Property Relationships in Materials 2

EMat 110L
1 unit
POLYMER MATERIALS (LABORATORY)
A 1- unit laboratory course that deals with the different experiments that aimed at acquainting students with the range of properties of polymers, methods of synthesis, characteristics, identification of polymers and its physical chemistry.

At the end of this course, the student must be able to conduct experiments that will synthesize and modify polymers, test their properties and use a fabrication technique to produce polymers.
Co-requisite: EMat 110- Polymer Materials (lecture)

SYNTHESIS AND PROCESSING OF MATERIALS .
This course deals with the overview of the synthesis and processing of materials (natural or synthetic) from their sources. Forming of synthesized materials (e.g. slip casting, sintering, injection molding) into semi-finished and finished products. Plastic deformation processing with focus on metal systems; tools and equipment (forging, rolling, extrusion, drawing, forming and machining).

At the end of this course, the student must be able to make a report citing the major challenges behind each synthesis and processing method, and problems related to synthesis and processing of materials.
Prerequisite: EMat 108- Kinetics of Materials &
Processes
GE 112- Mechanics of deformable bodies

EMat 112 3 units
DESIGN AND ANALYSIS OF EXPERIMENTS IN MATERIALS ENGINEERING
This course deals with major considerations in the design of experiments; review of fundamental statistical concepts; design and analysis of experiments in materials engineering with illustrative examples applicable to variable screening, optimization and mechanistic studies.

At the end of this course, the student must be able to write a research proposal for undergraduate level thesis. Apply design of experiment (DOE) fundamentals to assigned problems.
Prerequisite: MATHMW-Mathematics for Engineers

EMat 113 3 units
DEGRADATION OF MATERIALS (LECTURE) This course deals with general introduction to the degradation and failure of materials; ductile and brittle behavior; failure analysis techniques, failure modes such as fatigue, wear, creep, corrosion, hydrogen embrittlement, degradation of materials in industrial applications.

At the end of this course, the student must be able to design the most appropriate procedure for performing failure analysis and strengthening mechanism on metallic specimens.
Prerequisite: EMat 105- Structure-Property
Relationships in Materials

EMat 113L 1 unit
DEGRADATION OF MATERIALS (LABORATORY)
A 1- unit laboratory course that deals with the different experiments of mechanisms by which corrosion and wear occur under different conditions. It also covers different types of testing; destructive and nondestructive methods of failure analysis.

to conduct experiments that will test the mode of failure of materials and degradation by corrosion. Co-requisite: EMat 113-Degradation of Materials (lecture)

EMat 114 3 units
COMPOSITE MATERIALS (LECTURE)
This course deals with structure and properties of fibers, matrices and final composites; fabrication techniques and processing of composites; degradation and failure analysis of composites.

At the end of this course, the student must be able to defend a design proposal that addresses a specific problem of a given community or institution in relation to composite materials. Prerequisite: EMat 105- Structure-Property Relationships in Materials 2

EMat 114L 1 unit
COMPOSITE MATERIALS (LABORATORY)
A 1- unit laboratory course that deals with the different experiments to produce different composite materials and characterize and identify different reinforcing materials, as well as determine its characteristics. Test properties of different composite materials.

At the end of this course, the student must be able to conduct experiments that will evaluate the physical and mechanical properties of composite materials. Select appropriate processing techniques for composite fabrication.
Co-requisite: EMat 114- Composite Materials
(lecture
)

EMat 115 3 units
MATERIALS SELECTION AND PLANT DESIGN (LECTURE)
This course deals with major considerations in selecting a material suitable for a specific application. Elements of plant design including choice of process, equipment and materials, site and plant layout.

At the end of this course, the student must be able to perform a Materials selection process to identify the material that is best suited to meet the design requirements.
Prerequisite: EMat 105- Structure-Property Relationships in Materials 2
GE 112- Mechanics of deformable bodies

EMat 115L 1 unit
MATERIALS SELECTION AND PLANT DESIGN (LABORATORY)
A 1- unit laboratory course that applies the principles of Materials Selection and Plant Design. Assess different Materials Engineering plant based on some major considerations.

At the end of this course, the student must be able to conduct general assessment of an existing materials engineering or manufacturing plant design based on lay-out and other major considerations.
Co-requisite: EMat 115- Materials Selection and Plant Design
(lecture)

ON-THE-JOB TRAINING
This course requires at least 240 hours on-the-job training in an appropriate plant or facility which is primarily involved in materials engineering practice. Student must submit a written report output of the training obtained according to a prescribed format.

At the end of this course, the student must be able to perform routine, periodic or preventive maintenance activities during plant operation. Compose a complete project documentation and technical report. Know and respect to ethical standards of the company.
Prerequisite: 3rd year standing

EMat 117 3 units
FORENSIC ENGINEERING
This course deals with failure analysis of materials; destructive and non-destructive testing methods related to failure analysis and reliability testing; industrial standards for materials.

At the end of this course, the student must be able to perform a well-thought methodology for failure analysis of materials and provide recommendation from a materials engineering perspective.
Prerequisite: EMat 113- Degradation of Materials

EMat 118 1 unit
LAWS, ETHICS, SEMINARS AND PLANT VISIT (WITH SAFETY)
Seminar with emphasis on technical papers on different topics involved in the current trends of materials engineering research and development; Plant visit to materials engineering facilities with emphasis on observation of process and operation. Submission and presentation of reports of the visits.

At the end of this course, the student must be able to submit reports and reaction paper outputs from seminars attended. Describe the flowsheet and operations of plants visited and identify best practices in plants visited.
Prerequisite: 4th year standing

EMat1R 3 units
METHODS OF RESEARCH
This course deals with research preparation methods, research tools, research proposals, and the implementation, presentation and publication of research work.

It is expected at the end of the course for student to write and defend a Materials Engineering research proposal.

EMat 119 2 units
MATERIALS RESEARCH PROJECT (OR UNDERGRADUATE THESIS)
This course deals with application of research and development methodologies to a study by individual or group with supervision of a faculty on a selected topic in materials engineering worthy of research. Writing of research proposals on

assigned topics and presentation of output and submission of final report.

At the end of this course, the student must be able to conduct an independent literature review relevant to a specific materials engineering problem. Design an experiment to address a specific materials engineering problem within the identified research constraints. Defend a research proposal based on prescribed guidelines. Prerequisite: EMat 112- Design and Analysis of Experiments in Materials Engineering

EMat 120 3 units
SPECIAL MATERIALS (SPECIAL TOPICS)
This course deals with specialization topics of interest to materials engineers which is Special Materials (Engineering Polymers and Rubber), Advanced Ceramics, Nanomaterials, Technological Innovation. It deals with the different new materials, its structures, properties, processing, and applications. The course explains the significance of different new materials discovered and used nowadays. It will also cover the new trends of new materials.

At the end of this course, the student must be able to evaluate which materials are most likely to be promising candidates for utilization and application to provide solution to complex engineering problems through research output and oral presentation.
Prerequisite: EMat 105- Structure-Property Relationships in Materials 2

EMat 121 3 units
QUALITY ASSURANCE
This course deals with the study of the basic principles of quality assurance using established quality techniques based on statistical tools such as control charts for variables and attributes, ANOVA, and lot-by-lot acceptance sampling.

At the end of this course, the student must be able to prepare a report on the most relevant quality standards such as ISO parameters.