



Republic of the Philippines
BATANGAS STATE UNIVERSITY
BatStateU Alangilan
Alangilan, Batangas City



College of Engineering, Architecture and Fine Arts
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CURRICULUM

Bachelor of Science in Metallurgical Engineering (BSMetE)

Academic Year: 2021-2022

Reference CMOs: CMO No. 100 s. 2017, CMO No. 4 s. 2018 and CMO No. 20 s. 2013

Curriculum Description

Metallurgical Engineering is a profession that involves the teaching and practice of physical and/or chemical processing and treatment of metals from ores to achieve properties required for their application. It is also the study of the properties of metallic materials by altering the microscopic structure with alloying additions and special treatments, and designing and processing techniques to transform these metals into useful shapes, such as billets, ingots, bars and slabs. In the mining and manufacturing industries, metallurgical engineers apply their knowledge of metals to solve complex problems. They deal with all aspects of the production and application of metals and their alloys. This means that they must learn about each stage of the metal-making process, from mining and extraction through alloy formation and the use of metals in finished products.

Graduates of this program are in academic, industrial, and government sectors. Job functions include research, teaching, process engineering and optimization and production of metallic materials and related products. The program includes core courses, specialization courses, elective courses, and plant design and research. The program will adopt outcome-based education (OBE) framework with flipped classroom and other blended learning pedagogies.

Program Educational Objectives of Metallurgical Engineering

The Metallurgical Engineering alumni three to five years after graduation shall:

1. **Specialist.** Practiced as specialist in solving complex metallurgical engineering problems leading to improvements and innovations, while taking into consideration the environmental, social, and economical requirements.
2. **Professionalism and Leadership.** Assumed leadership position in industry, academe, government, or private sector with consideration to social and ethical responsibility.
3. **Lifelong Learning.** Engaged in lifelong learning through further studies, research, certifications, promotions, and other personal and professional development activities.

Institutional Graduate Attributes

The student should achieve at least 75% for each IGA upon graduation.

1. **Knowledge Competence.** Demonstrate a mastery of the fundamental knowledge and skills required for functioning effectively as a professional in the discipline, and an ability to integrate and apply them effectively to practice in the workplace.
2. **Creativity and Innovation.** Experiment with new approaches, challenge existing knowledge boundaries and design novel solutions to solve problems.

3. **Critical and Systems Thinking.** Identify, define, and deal with complex problems pertinent to the future professional practice or daily life through logical, analytical and critical thinking.
4. **Communication.** Communicate effectively (both orally and in writing) with a wide range of audiences, across a range of professional and personal contexts, in English and Pilipino.
5. **Lifelong Learning.** Identify own learning needs for professional or personal development; demonstrate an eagerness to take up opportunities for learning new things as well as the ability to learn effectively on their own.
6. **Leadership, teamwork, and Interpersonal Skills.** Function effectively both as a leader and as a member of a team; motivate and lead a team to work towards goal; work collaboratively with other team members; as well as connect and interact socially and effectively with diverse culture.
7. **Global Outlook.** Demonstrate an awareness and understanding of global issues and willingness to work, interact effectively and show sensitivity to cultural diversity.
8. **Social and National Responsibility.** Demonstrate an awareness of their social and national responsibility; engage in activities that contribute to the betterment of the society; and behave ethically and responsibly in social, professional and work environments.

Student Outcomes

The following skills, knowledge, and behaviors are expected to be attained by students as they progress through the program:

1. **Discipline Knowledge.** Ability to apply mathematics, sciences and principles of engineering to solve complex metallurgical engineering problems;
2. **Investigation.** Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;
3. **Design/Development of Solutions.** Design solution, system, components, processes, exhibiting improvements/innovations, that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues.
4. **Leadership and Teamwork.** Function effectively as a member of a leader on a diverse team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
5. **Problem Analysis.** Identify, formulate, and solve complex metallurgical engineering problems by applying principles of engineering, science, and mathematics;
6. **Ethics and Professionalism.** Apply ethical principles and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, environmental, and societal contexts.
7. **Communication.** Communicate effectively on complex engineering activities with the community, and the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;

8. **Environment and Sustainability.** Recognize the impact of professional engineering solutions in societal, global, and environmental contexts and demonstrate knowledge of and need for sustainable development;
9. **Lifelong Learning.** Recognize the need for, and ability to engage in independent and life-long learning in the broadest context of technological change.
10. **The Engineer and Society.** Apply reasoning based on contextual knowledge to assess societal, health, safety, legal, cultural, contemporary issues, and the consequent responsibilities relevant to professional engineering practices.
11. **Modern Tool Usage.** Apply appropriate techniques, skills, and modern engineering and IT tools to complex metallurgical engineering activities;
12. **Project Management and Finance.** Demonstrate knowledge and understanding of engineering management and financial principles as member or a leader of a team to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship.
13. **Social and National Responsibility.** Apply acquired metallurgical engineering knowledge and skills in addressing community problems that contributes to national development.

CURRICULUM COMPONENTS

Classification/Field/Course	Credit Units	Number of Hours/Week	
		Lec	Lab
TECHNICAL COURSES			
A. Mathematics			
Differential Calculus	3	3	0
Integral Calculus	3	3	0
Differential Equations	3	3	0
Engineering Data Analysis	3	3	0
Calculus 3	2	2	0
Subtotal	14	14	0
B. Natural/Physical Sciences			
General Chemistry	4	3	3
Physics 1	4	3	3
Modern Biology	3	2	3
Principles of Geology	2	2	0
Subtotal	13	10	9
C. Basic Engineering Sciences			
Computer Programming 1	1	0	3
Engineering Drawing	1	0	3
Statics of Rigid Bodies	3	3	0
Dynamics of Rigid Bodies	2	2	0
Mechanics of Deformable Bodies	3	3	0
Computer-Aided Design	1	0	3
Environmental Science and Engineering	3	3	0
Engineering Management	2	2	0
Technopreneurship	3	3	0
Engineering Economics	3	3	0
Research Methods	3	3	0
Material Science and Engineering	3	3	0
Introduction to Engineering	1	0	3
Subtotal	29	25	12
D. Allied Courses			
Basic Electrical Engineering	3	2	3
Analytical Chemistry	4	2	6
Principles of Mining	3	3	0
Fluid Mechanics	3	3	0
Subtotal	13	10	9
E. Professional Courses			
Introduction to Metallurgical Engineering	1	1	0
Mineral Processing 1	4	3	3
Workshop Theory and Practice	1	0	3
Mineral Processing 2	5	3	6
Ore Microscopy and Mineralogy	3	2	3
Metallurgical Physical Chemistry	4	3	3
Metallurgical Analysis	3	1	6
Physical Metallurgy 1	4	3	3
Physical Metallurgy 2	3	2	3

Mechanical and Adaptive Metallurgy	4	3	3
MetE Plant Design (Lecture)	2	2	0
Hydrometallurgy	4	3	3
Pyrometallurgy	4	3	3
Computer Applications in Metallurgical Engineering	3	2	3
MetE Plant Design (Laboratory)	1	0	3
Electrometallurgy	3	2	3
MetE Research Project 1	1	0	3
MetE Research Project 2	1	0	3
Industrial Production of Metals	3	3	0
Metallurgical Evaluation	3	2	3
Integrative Studies	2	0	6
On- the Job- Training	4	320 hours	
Metallurgical Law, Ethics, Seminars and Plant Visit	1	0	3
MetE Technical Elective 1	3	3	0
MetE Technical Elective 2	3	3	0
Subtotal	70	44	66
NON-TECHNICAL COURSES			
A. General Education Courses			
Understanding the Self	3	3	0
Mathematics in the Modern World	3	3	0
Readings in Philippine History	3	3	0
Purposive Communication	3	3	0
The Contemporary World	3	3	0
Art Appreciation	3	3	0
Science, Technology and Society	3	3	0
Ethics	3	3	0
People and the Earth's Ecosystem	3	3	0
Subtotal	27	27	0
B. Mandated Courses			
Life and Works of Rizal	3	3	0
Kontekstwalisadong Komunikasyon sa Filipino	3	3	0
ASEAN Literature	3	3	0
Subtotal	9	9	0
C. Physical Education			
Physical Fitness, Gymnastics and Aerobics	2	2	0
Rhythmic Activities	2	2	0
Individual and Dual Sports	2	2	0
Team Sports	2	2	0
Subtotal	8	8	0
D. National Service Training Program			
National Service Training Program 1	3	3	0
National Service Training Program 2	3	3	0
Subtotal	6	6	0
Grand Total	189	153	96

PROGRAM OF STUDY

FIRST YEAR						
FIRST SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
GEEd 101	Understanding the Self	3	3	0		
GEEd 102	Mathematics in the Modern World	3	3	0		
GEEd 105	Readings in Philippine History	3	3	0		
GEEd 106	Purposive Communication	3	3	0		
SCI 401	General Chemistry	4	3	3		
MATH 401	Differential Calculus	3	3	0		
ENGG 401	Introduction to Engineering	1	0	3		
PE 101	Physical Fitness, Gymnastics and Aerobics	2	2	0		
NSTP 111	National Service Training Program 1	3	3	0		
Total		25	23	6		

FIRST YEAR						
SECOND SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
GEEd 104	The Contemporary World	3	3	0		
CpE 401	Computer Programming 1	1	0	3		
MATH 402	Integral Calculus	3	3	0	MATH 401	
ENGG 402	Engineering Drawing	1	0	3		
SCI 403	Physics 1	4	3	3	MATH 401	MATH 402
GEEd 109	Science, Technology and Society	3	3	0		
GEEd 108	Art Appreciation	3	3	0		
PE 102	Rhythmic Activities	2	2	0	PE 101	
NSTP 121	National Service Training Program 2	3	3	0	NSTP 111	
Total		23	20	9		

FIRST YEAR						
MIDTERM SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
GEEd 107	Ethics	3	3	0		
GEEd 103	Life and Works of Rizal	3	3	0		
SCI 402	Modern Biology	3	2	3		
Total		9	8	3		

SECOND YEAR						
FIRST SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
MetE 401	Introduction to Metallurgical Engineering	1	1	0		
MATH 404	Differential Equations	3	3	0	MATH 402	
SCI 405	Principles of Geology	2	2	0		
ME 403	Workshop Theory and Practice	1	0	3		
MetE 402	Ore Microscopy and Mineralogy	3	2	3	SCI 401	
ENGG 412	Material Science and Engineering	3	3	0	SCI 401	
ChE 401	Analytical Chemistry	4	2	6	SCI 401	
ENGG 407	Statics of Rigid Bodies	3	3	0	MATH 402, SCI 403	
EE 419	Basic Electrical Engineering	3	2	3	SCI 403	
PE 103	Individual and Dual Sports	2	2	0	PE 101	
Total		25	20	15		

SECOND YEAR						
SECOND SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
MATH 405	Calculus 3	2	2	0	MATH 402	
Fili 101	Kontekstwalisadong Komunikasyon sa Filipino	3	3	0		
MetE 403	Principles of Mining	3	3	0		
ENGG 408	Dynamics of Rigid Bodies	2	2	0	ENGG 407	
MetE 404	Metallurgical Physical Chemistry	4	3	3	ChE 401	
MetE 405	Metallurgical Analysis	3	1	6	SCI 401	
ENGG 418	Mechanics of Deformable Bodies	3	3	0	ENGG 407	
MetE 406	Mineral Processing 1	4	3	3	ENGG 401, MetE 402	
PE 104	Team Sports	2	2	0	PE 101	
Total		26	22	12		

THIRD YEAR						
FIRST SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
MetE 407	Mineral Processing 2	5	3	6	MetE 406	
MetE 408	Physical Metallurgy 1	4	3	3	MetE 404	
MetE 409	Computer Applications in Metallurgical Engineering	3	2	3		
ENGG 403	Computer-Aided Design	1	0	3	ENGG 402	
MetE 410	Hydrometallurgy	4	3	3	MetE 404	
ME 406	Fluid Mechanics	3	3	0	ENGG 408	
MATH 403	Engineering Data Analysis	3	3	0	GEd 102	
Total		23	17	18		

THIRD YEAR						
SECOND SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
MetE 411	Physical Metallurgy 2	3	2	3	MetE 408	
MetE 412	Mechanical and Adaptive Metallurgy	4	3	3	MetE 408	
MetE 413	Electrometallurgy	3	2	3	MetE 404	
MetE 414	Pyrometallurgy	4	3	3	MetE 404	
ENGG 416	Research Methods	3	3	0	MATH 403	
MetE 415	Metallurgical Evaluation	3	2	3		MetE 412
MetEE 401	MetE Technical Elective 1	3	3	0		
MetE 416	Metallurgical Law, Ethics, Seminars and Plant Visit	1	0	3		
Total		24	18	18		

THIRD YEAR						
MIDTERM SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
ENGG 404	Engineering Economics	3	3	0	MATH 402	
Litr 102	ASEAN Literature	3	3	0		
ENGG 413	Environmental Science and Engineering	3	3	0	SCI 401	
Total		9	9	0		

FOURTH YEAR						
FIRST SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
ENGG 417	On-the-Job Training	4	320 hrs		4th Year Regular Standing	
MetE 417	MetE Research Project 1	1	0	3	4th Year Regular Standing	
Total		5	0	3		

FOURTH YEAR						
SECOND SEMESTER						
Course Code	Course Title	Units	No. Hour/s		Pre-requisite(s)	Co-Requisite(s)
			Hrs Lec	Hrs Lab		
ENGG 405	Technopreneurship	3	3	0	4th Year Standing	
ENGG 406	Engineering Management	2	2	0	4th Year Standing	
MetEE 402	MetE Technical Elective 2	3	3	0		
MetE 418	MetE Research Project 2	1	0	3	MetE 417	
MetE 419	MetE Plant Design (Lecture)	2	2	0	4th Year Standing	
MetE 420	MetE Plant Design (Laboratory)	1	0	3	4th Year Standing	
GE 110	People and the Earth's Ecosystems	3	3	0		
MetE 421	Industrial Production of Metals	3	3	0	MetE 410, MetE 414	
MetE 422	Integrative Studies	2	0	6	Graduating Standing	
Total		20	16	12		
TOTAL CREDIT UNITS		189	153	96		