Republic of the Philippines
BATANGAS STATE UNIVERSITY
BatStateU Alangilan
Alangilan, Batangas City
College of Engineering, Architecture and Fine Arts
https://batstate-u.edu.ph, Tel. No. (043) 425-0139 loc. 0118/2121

CURRICULUM
Bachelor of Science in Biomedical Engineering (BSBioE)

Academic Year: 2021-2022
Reference CMOs: CMO No.101 s. 2017, CMO No. 4 s. 2018 and CMO No. 20 s. 2013

Curriculum Description

Biomedical engineering is a discipline that advances knowledge in engineering, biology and medicine, and improves human health through cross-disciplinary activities that integrate the engineering sciences with the biomedical sciences and clinical practice. It is delivered using various OBE and CDIO based learning principles.

Program Educational Objectives of Biomedical Engineering

The Biomedical Engineering alumni three to five years graduation shall:

1. **Specialist.** Practiced as specialist in solving complex biomedical 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.

Students Outcomes

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

1. **Discipline Knowledge.** Ability to apply mathematics, sciences and principles of engineering to solve complex biomedical 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 biomedical 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 biomedical 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 biomedical 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
Engineering Data Analysis	3	3	0
Differential Equations	3	3	0
Sub Total	**12**	**12**	**0**
B. Natural/Physical Sciences			
General Chemistry	4	3	3
Physics 1	4	3	3
Physics 2	4	3	3
Modern Biology	3	3	0
Sub Total	**15**	**12**	**9**
C. Basic Engineering Sciences			
Introduction to Engineering	1	0	3
Computer Programming 1	1	0	3
Engineering Drawing	1	0	3
Computer-Aided Design	1	0	3
Engineering Mechanics	3	3	0
Research Methods	3	3	0
Engineering Economics	3	3	0
Engineering Management	2	2	0
Sub Total	**15**	**11**	**12**
D. Allied Courses			
Thermodynamics	3	3	0
Basic Electrical Engineering	3	2	3
Material Science and Engineering	3	3	0
Environmental Science and Engineering	3	3	0
Basic Occupational Safety and Health	3	3	0
Electronics Circuits: Devices and Analysis	4	3	3
Microprocessor and Microcontroller Systems and Design	4	3	3
Technopreneurship	3	3	0
Sub Total	**26**	**23**	**9**
E. Professional Courses			
Principles of Molecular Biology	3	3	0
Human Physiology	3	3	0
Computational Bioengineering	4	3	3
Mechanics of Biological System	4	3	3
Biomeasurements	4	3	3
Introduction to Physiological Control System	3	3	0
Biofluid Mechanics	3	3	0
Biomedical Instrumentation and Devices	4	3	3
Muskoskeletal Mechanics	3	3	0
BioE Capstone Design 1	1	0	3
BioE Capstone Design 2	1	0	3
Biomedical Laws and Professional Ethics	3	3	0
Advanced Biomedical Instrumentation and Devices	4	3	3

On-the-Job Training	4	320 hours	
Advanced Engineering Mathematics for BioE	3	3	0
Biomedical Electronics	4	3	3
Programming and Modelling for BioE	2	0	6
Modelling in Biomedical Design	4	3	3
Biomedical Systems and Signals	4	3	3
Robotics for Biomedical Applications	4	3	3
BioE Seminars/Colloquium	1	0	3
BioE Elective 1	3	2	3
BioE Elective 2	3	2	3
BioE Elective 3	3	2	3
Sub Total	**75**	**54**	**51**
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
Sub Total	**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
Sub Total	**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
Sub Total	**8**	**8**	**0**
D. National Service Training Program			
National Service Training Program 1	3	3	0
National Service Training Program 2	3	3	0
Sub Total	**6**	**6**	**0**
Grand Total	**193**	**162**	**81**

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**		
GEd 101	Understanding the Self	3	3	0		
GEd 102	Mathematics in the Modern World	3	3	0		
GEd 105	Readings in Philippine History	3	3	0		
GEd 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**		
GEd 104	The Contemporary World	3	3	0		
GEd 108	Art Appreciation	3	3	0		
GEd 109	Science, Technology and Society	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
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**		
GEd 103	Life and Works of Rizal	3	3	0		
GEd 107	Ethics	3	3	0		
SCI 402	Modern Biology	3	3	0		
	Total	**9**	**9**	**0**		

SECOND YEAR						
FIRST SEMESTER						
Course Code	**Course Title**	**Units**	**No. Hour/s**		**Pre-requisite(s)**	**Co-Requisite(s)**
			Hrs Lec	**Hrs Lab**		
BioE 402	Principles of Molecular Biology	3	3	0	SCI 402	
BioE 401	Human Physiology	3	3	0	SCI 402	
MATH 403	Engineering Data Analysis	3	3	0	MATH 402	
MATH 404	Differential Equations	3	3	0	MATH 402	
ME 431	Thermodynamics	3	3	0	SCI 403	
SCI 404	Physics 2	4	3	3	SCI 403	
ENGG 403	Computer-Aided Design	1	0	3	ENGG 402	
EE 419	Basic Electrical Engineering	3	2	3	SCI 403	
PE 103	Individual and Dual Sports	2	2	0	PE 101	
	Total	**25**	**22**	**9**		

SECOND YEAR						
SECOND SEMESTER						
Course Code	**Course Title**	**Units**	**No. Hour/s**		**Pre-requisite(s)**	**Co-Requisite(s)**
			Hrs Lec	**Hrs Lab**		
BioE 403	Advanced Engineering Mathematics for BioE	3	3	0	MATH 404	
BioE 404	Computational Bioengineering	4	3	3	CpE 401	BioE 403
ENGG 409	Engineering Mechanics	3	3	0		
ENGG 412	Material Science and Engineering	3	3	0	SCI 401	
ECE 421	Electronics Circuits: Devices and Analysis	4	3	3	EE 419	
ENGG 413	Environmental Science and Engineering	3	3	0	SCI 401	
PE 104	Team Sports	2	2	0	PE 101	
Fili 101	Kontekstwalisadong Komunikasyon sa Filipino	3	3	0		
	Total	**25**	**23**	**6**		

THIRD YEAR						
FIRST SEMESTER						
Course Code	**Course Title**	**Units**	**No. Hour/s**		**Pre-requisite(s)**	**Co-Requisite(s)**
			Hrs Lec	**Hrs Lab**		
BioE 405	Programming and Modelling for BioE	2	0	6	BioE 404	BioE 406
BioE 406	Modelling in Biomedical Design	4	3	3	MATH 404	
BioE 407	Mechanics of Biological Systems	4	3	3	BioE 401, ENGG 409	
BioE 408	Biomeasurements	4	3	3	BioE 401, SCI 402	
BioE 409	Biomedical Systems and Signals	4	3	3	MATH 403, BioE 403	
BioEE 401	BioE Elective 1	3	2	3		
GEd 110	People and the Earth's Ecosystems	3	3	0		
	Total	**24**	**17**	**21**		

THIRD YEAR						
SECOND SEMESTER						
Course Code	**Course Title**	**Units**	**No. Hour/s**		**Pre-requisite(s)**	**Co-Requisite(s)**
			Hrs Lec	**Hrs Lab**		
BioE 410	Biomedical Electronics	4	3	3	ECE 421	BioE 405
BioE 411	Introduction to Physiological Control System	3	3	0	BioE 403, BioE 401	
BioE 412	Biofluid Mechanics	3	3	0	ME 431, BioE 407	BioE 414
BioE 413	Biomedical Instrumentation and Devices	4	3	3	BioE 408	BioE 410
BioE 414	Muskoskeletal Mechanics	3	3	0	BioE 407	BioE 412
ENGG 416	Research Methods	3	3	0	MATH 403	
BioEE 402	BioE Elective 2	3	2	3	BioEE 401	
	Total	**23**	**20**	**9**		

THIRD YEAR						
MIDTERM SEMESTER						
Course Code	**Course Title**	**Units**	**No. Hour/s**		**Pre-requisite(s)**	**Co-Requisite(s)**
			Hrs Lec	**Hrs Lab**		
ENGG 411	Basic Occupational Safety and Health	3	3	0		
ENGG 404	Engineering Economics	3	3	0	MATH 402	
	Total	**6**	**6**	**0**		

FOURTH YEAR						
FIRST SEMESTER						
Course Code	**Course Title**	**Units**	**No. Hour/s**		**Pre-requisite(s)**	**Co-Requisite(s)**
			Hrs Lec	**Hrs Lab**		
ECE 415	Microprocessor and Microcontroller Systems and Design	4	3	3	BioE 410	
ENGG 405	Technopreneurship	3	3	0	4th year standing	
BioE 415	BioE Capstone Design 1	1	0	3	ENGG 416	
ENGG 417	On-the-Job Training	4	320 hours		4th year standing	
	Total	**12**	**6**	**6**		

FOURTH YEAR						
SECOND SEMESTER						
Course Code	**Course Title**	**Units**	**No. Hour/s**		**Pre-requisite(s)**	**Co-Requisite(s)**
			Hrs Lec	**Hrs Lab**		
Litr 102	ASEAN Literature	3	3	0		
BioE 420	Advanced Biomedical Instrumentation and Devices	4	3	3	BioE 413	
BioE 416	Robotics for Biomedical Applications	4	3	3	BioE 407, BioE 413	
BioE 417	BioE Seminars/Colloquium	1	0	3		
BioE 418	BioE Capstone Design 2	1	0	3	BioE 415, Graduating Standing	
BioE 419	Biomedical Laws and Professional Ethics	3	3	0		
ENGG 406	Engineering Management	2	2	0		
BioEE 403	BioE Elective 3	3	2	3	BioEE 402	
	Total	**21**	**16**	**15**		
	TOTAL CREDIT UNITS	**193**	**162**	**81**		