



Republic of the Philippines
BATANGAS STATE UNIVERSITY
The National Engineering University
Alangilan Campus

Golden Country Homes, Alangilan, Batangas City, Philippines 4200

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College of Engineering

CURRICULUM

Bachelor of Science in Mechatronics Engineering (BSMexE)

Academic Year 2023-2024

Reference CMOs: CMO No. 4 s. 2018 and CMO No. 20 s. 2013, CMO No. 39 s. 2021,
CMO No. 40 s. 2021

Curriculum Description

Mechatronics Engineering deals with the branch of engineering that integrates available and emerging technologies with knowledge in mathematics, natural, social and applied sciences to conceptualize, design, and implement new, improved, or innovative mechatronics systems, devices, goods, services and processes.

Program Educational Objectives

The mechatronics engineering alumni three to five years after graduation shall;

1. Apply knowledge, skills and abilities in mechanical engineering, electrical engineering, electronics engineering, and computing in solving inter-disciplinary problems.
2. Work and lead competently, efficiently and effectively in multi-disciplinary teams to achieve design and/or project objectives.
3. Participate in lifelong learning to maintain professional, ethical and societal responsibilities.

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.



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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 mechatronics 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 mechatronics 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;



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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 mechatronics 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; and
13. **Social and National Responsibility.** Apply acquired mechatronics engineering knowledge and skills in addressing community problems that contributes to national development.



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CURRICULUM COMPONENTS

| Classification/ Field / Course | No. of Hours/Week | | Credit Units |
|--|-------------------|-----|--------------|
| | Lec | Lab | |
| I. TECHNICAL COURSES | | | |
| A. Mathematics | | | |
| Differential Calculus | 3 | 0 | 3 |
| Integral Calculus | 3 | 0 | 3 |
| Engineering Data Analysis | 3 | 0 | 3 |
| Differential Equations | 3 | 0 | 3 |
| Sub-total | 12 | 0 | 12 |
| B. Natural/Physical Sciences | | | |
| General Chemistry | 3 | 3 | 4 |
| Modern Biology | 2 | 3 | 3 |
| Physics 1 | 3 | 3 | 4 |
| Sub-total | 8 | 9 | 11 |
| C. Basic Engineering Sciences | | | |
| Introduction to Engineering | 0 | 3 | 1 |
| Engineering Drawing | 0 | 3 | 1 |
| Computer-Aided Design | 0 | 3 | 1 |
| Engineering Economics | 3 | 0 | 3 |
| Technopreneurship | 3 | 0 | 3 |
| Engineering Management | 2 | 0 | 2 |
| Sub-total | 8 | 9 | 11 |
| D. Allied Courses | | | |
| Computer Programming 1 | 0 | 3 | 1 |
| Digital Principles and Logic Design | 3 | 3 | 4 |
| Electronics Circuits: Devices and Analysis | 3 | 3 | 4 |
| Control Systems Engineering | 2 | 3 | 3 |
| Fundamentals of Data Communications | 3 | 0 | 3 |
| Power Electronics | 1 | 3 | 2 |
| Circuits 1 | 3 | 3 | 4 |
| Circuits 2 | 3 | 3 | 4 |
| Thermodynamics | 3 | 0 | 3 |
| Engineering Mechanics | 3 | 0 | 3 |
| Basic Occupational Safety and Health | 3 | 0 | 3 |
| Materials Science and Engineering | 3 | 0 | 3 |
| Environmental Science and Engineering | 3 | 0 | 3 |
| Physics 2 | 3 | 3 | 4 |
| Sub-total | 36 | 24 | 44 |
| E. Professional Courses | | | |
| 1. Core Courses | | | |
| Advanced Engineering Mathematics for MexE | 3 | 0 | 3 |



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| | | | |
|---|------------|-----------|------------|
| Introduction to Electro-mechanical Systems and Automation | 3 | 0 | 3 |
| Pneumatics and Hydraulics Systems | 2 | 3 | 3 |
| Physical Systems Modelling of Machine Elements | 1 | 3 | 2 |
| Basic Workshop and Machining | 1 | 3 | 2 |
| Robotics 1 | 3 | 0 | 3 |
| PLC Fundamentals and Programming | 2 | 3 | 3 |
| CAD/CAM and CNC | 0 | 3 | 1 |
| Robotics 2 | 2 | 3 | 3 |
| Codes, Standards and Professional Ethics | 3 | 0 | 3 |
| MexE Seminars/Colloquium | 0 | 3 | 1 |
| Advanced PLC and Systems Integration | 3 | 3 | 4 |
| MexE Capstone Design 1 | 0 | 3 | 1 |
| MexE Capstone Design 2 | 0 | 3 | 1 |
| Microprocessor and Microcontroller Systems and Design | 3 | 3 | 4 |
| Electronics Measurements and Instrumentation | 1 | 3 | 2 |
| Sensors Engineering | 2 | 3 | 3 |
| Industrial Drives and Control | 2 | 3 | 3 |
| Research Methods | 3 | 0 | 3 |
| Manufacturing and Quality Control | 3 | 0 | 3 |
| Sub-total | 37 | 42 | 51 |
| | | | |
| 2. Technical Electives | | | |
| MexE Elective 1 | 3 | 0 | 3 |
| MexE Elective 2 | 3 | 0 | 3 |
| Sub-total | 6 | 0 | 6 |
| F. On-the-Job Training | 320 hrs | | 4 |
| Total (Technical Courses) | 107 | 84 | 139 |
| | | | |
| II. NON-TECHNICAL COURSES | | | |
| A. General Education Course | | | |
| Understanding the Self | 3 | 0 | 3 |
| Mathematics in the Modern World | 3 | 0 | 3 |
| The Contemporary World | 3 | 0 | 3 |
| Readings in Philippine History | 3 | 0 | 3 |
| Purposive Communication | 3 | 0 | 3 |
| Ethics | 3 | 0 | 3 |
| Art Appreciation | 3 | 0 | 3 |
| Science, Technology and Society | 3 | 0 | 3 |
| Sub-total | 24 | 0 | 24 |
| | | | |
| B. Filipino/Literature/Mandated Courses | | | |
| Kontekstwalisadong Komunikasyon sa Filipino | 3 | 0 | 3 |
| Filipino sa Iba't Ibang Disiplina | 3 | 0 | 3 |
| ASEAN Literature | 3 | 0 | 3 |
| Life and Works of Rizal | 3 | 0 | 3 |
| Sub-total | 8 | 0 | 8 |



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| | | | |
|---|------------|-----------|------------|
| C. Physical Activities Toward Health and Fitness | | | |
| PATHFit 1 - Movement Competency Training | 2 | 0 | 2 |
| PATHFit 2 - Exercise-based Fitness Activities | 2 | 0 | 2 |
| PATHFit 3 – Menu of Dance, Sports, Martial Arts, Group Exercise, Outdoor Adventure Activities Menu Offering: (Traditional and Recreational Games) | 2 | 0 | 2 |
| PATHFit 4 – Menu of Dance, Sports, Martial Arts, Group Exercise, Outdoor Adventure Activities Menu Offering: (Team Sports, Basketball and Volleyball) | 2 | 0 | 2 |
| Sub-total | 8 | 0 | 8 |
| D. National Service Training Program | | | |
| NSTP 1 | 3 | 0 | 3 |
| NSTP 2 | 3 | 0 | 3 |
| Sub-total | 6 | 0 | 6 |
| Total (Non-Technical Courses) | 50 | 0 | 50 |
| GRAND TOTAL | 157 | 84 | 189 |

| SUMMARY | |
|---|------------------------|
| Courses | Number of Units |
| I. Technical Courses | |
| A. Mathematics | 12 |
| B. Natural/Physical Sciences | 11 |
| C. Basic Engineering Sciences | 11 |
| D. Allied Courses | 44 |
| E. Professional Courses | |
| 1. Core Courses | 51 |
| 2. Elective Courses | 6 |
| F. OJT | 4 |
| II. Non-Technical Courses | |
| A. General Education Courses | 24 |
| B. Filipino/Literature/Mandated Courses | 12 |
| C. PATHFit 1-4 | 8 |
| D. NSTP | 6 |
| GRAND TOTAL | 189 |



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PROGRAM OF STUDY

| FIRST YEAR | | | | | | |
|----------------|-------------------------------------|---------------|-----|--------|-----------------|----------------|
| First Semester | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| MATH 401 | Differential Calculus | 3 | 0 | 3 | | |
| SCI 401 | General Chemistry | 3 | 3 | 4 | | |
| ENGG 401 | Introduction to Engineering | 0 | 3 | 1 | | |
| GE d 102 | Mathematics in the Modern World | 3 | 0 | 3 | | |
| GE d 105 | Readings in Philippine History | 3 | 0 | 3 | | |
| GE d 101 | Understanding the Self | 3 | 0 | 3 | | |
| GE d 106 | Purposive Communication | 3 | 0 | 3 | | |
| PATHFit 1 | Movement Competency Training | 2 | 0 | 2 | | |
| NSTP 111 | National Service Training Program 1 | 3 | 0 | 3 | | |
| Total | | 23 | 6 | 25 | | |

| FIRST YEAR | | | | | | |
|-----------------|-------------------------------------|---------------|-----|--------|-----------------|----------------|
| Second Semester | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| MATH 402 | Integral Calculus | 3 | 0 | 3 | MATH 401 | |
| SCI 403 | Physics 1 | 3 | 3 | 4 | MATH 401 | MATH 402 |
| GE d 104 | The Contemporary World | 3 | 0 | 3 | | |
| GE d 109 | Science, Technology and Society | 3 | 0 | 3 | | |
| GE d 108 | Art Appreciation | 3 | 0 | 3 | | |
| ENGG 402 | Engineering Drawing | 0 | 3 | 1 | | |
| CpE 401 | Computer Programming 1 | 0 | 3 | 1 | | |
| PATHFit 2 | Exercise-based Fitness Activities | 2 | 0 | 2 | PATHFit 1 | |
| NSTP 121 | National Service Training Program 2 | 3 | 0 | 3 | NSTP 111 | |
| Total | | 20 | 9 | 23 | | |

| FIRST YEAR | | | | | | |
|-------------|-------------------------|---------------|-----|--------|-----------------|----------------|
| Midterm | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| GE d 103 | Life and Works of Rizal | 3 | 0 | 3 | | |
| GE d 107 | Ethics | 3 | 0 | 3 | | |
| SCI 402 | Modern Biology | 2 | 3 | 3 | | |
| Total | | 8 | 3 | 9 | | |



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| SECOND YEAR | | | | | | |
|----------------|---|---------------|-----|--------|-------------------|----------------|
| First Semester | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| MATH 404 | Differential Equations | 3 | 0 | 3 | MATH 402 | |
| SCI 404 | Physics 2 | 3 | 3 | 4 | SCI 403 | |
| ENGG 403 | Computer-Aided Design | 0 | 3 | 1 | ENGG 402 | |
| MATH 403 | Engineering Data Analysis | 3 | 0 | 3 | MATH 402 | |
| ENGG 413 | Environmental Science and Engineering | 3 | 0 | 3 | SCI 401 | |
| ENGG 409 | Engineering Mechanics | 3 | 0 | 3 | SCI 403 | |
| EE 424 | Circuits 1 | 3 | 3 | 4 | MATH 402 | SCI 404 |
| ME 431 | Thermodynamics | 3 | 0 | 3 | SCI 403, MATH 402 | |
| PATHFit 3 | Menu of Dance, Sports, Martial Arts, Group Exercise, Outdoor Adventure Activities Menu Offering: (Traditional and Recreational Games) | 2 | 0 | 2 | PATHFit 1 and 2 | |
| Total | | 23 | 9 | 26 | | |

| SECOND YEAR | | | | | | |
|-----------------|---|---------------|-----|--------|--------------------|----------------|
| Second Semester | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| MexE 401 | Advanced Engineering Mathematics for MexE | 3 | 0 | 3 | MATH 404 | |
| MexE 402 | Introduction to Electro-mechanical Systems and Automation | 3 | 0 | 3 | EE 424, ENGG 409 | |
| MexE 403 | Pneumatics and Hydraulics Systems | 2 | 3 | 3 | ME 431 | |
| MexE 404 | Physical Systems Modelling of Machine Elements | 1 | 3 | 2 | ENGG 403, ENGG 409 | |
| ECE 405 | Digital Principles and Logic Design | 3 | 3 | 4 | EE 424 | ECE 421 |
| ECE 421 | Electronics Circuits: Devices and Analysis | 3 | 3 | 4 | EE 424 | |
| EE 425 | Circuits 2 | 3 | 3 | 4 | EE 424 | MexE 401 |
| PATHFit 4 | Menu of Dance, Sports, Martial Arts, Group Exercise, Outdoor Adventure Activities Menu Offering: (Team Sports, Basketball and Volleyball) | 2 | 0 | 2 | PATHFit 1 and 2 | |
| Total | | 20 | 15 | 25 | | |



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| THIRD YEAR | | | | | | |
|----------------|--|---------------|-----|--------|--------------------|----------------|
| First Semester | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| MexE 405 | Basic Workshop and Machining | 1 | 3 | 2 | MexE 404 | ENGG 412 |
| MexE 406 | Robotics 1 | 3 | 0 | 3 | ENGG 410, MexE 401 | |
| MexE 407 | PLC Fundamentals and Programming | 2 | 3 | 3 | ECE 405, MexE 403 | |
| ECE 426 | Fundamentals of Data Communications | 3 | 0 | 3 | | |
| ECE 427 | Electronics Measurements and Instrumentation | 1 | 3 | 2 | ECE 421, CpE 401 | |
| ECE 428 | Power Electronics | 1 | 3 | 2 | ECE 421 | |
| ENGG 404 | Engineering Economics | 3 | 0 | 3 | MATH 402 | |
| ENGG 412 | Materials Science and Engineering | 3 | 0 | 3 | SCI 401 | |
| Total | | 17 | 12 | 21 | | |

| THIRD YEAR | | | | | | |
|-----------------|---|---------------|-----|--------|-------------------|----------------|
| Second Semester | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| MexE 408 | CAD/CAM and CNC | 0 | 3 | 1 | MexE 405 | |
| MexE 409 | Robotics 2 | 2 | 3 | 3 | MexE 406 | |
| ECE 425 | Control Systems Engineering | 2 | 3 | 3 | MATH 404, EE 425 | |
| ICE 405 | Sensors Engineering | 2 | 3 | 3 | | ECE 427 |
| ICE 406 | Industrial Drives and Control | 2 | 3 | 3 | EE 425 | |
| Fili 101 | Kontekstwalisadong Komunikasyon sa Filipino | 3 | 0 | 3 | | |
| ENGG 416 | Research Methods | 3 | 0 | 3 | MATH 403 | |
| MexEE 401 | MexE Elective 1 | 3 | 0 | 3 | 3rd year standing | |
| Total | | 17 | 15 | 22 | | |

| THIRD YEAR | | | | | | |
|-------------|---|---------------|-----|--------|-------------------|----------------|
| Midterm | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| ECE 415 | Microprocessor and Microcontroller Systems and Design | 3 | 3 | 4 | CpE 401, ECE 405 | |
| MexE 410 | Codes, Standards and Professional Ethics for MexE | 3 | 0 | 3 | 4th year standing | |
| ENGG 411 | Basic Occupational Safety and Health | 3 | 0 | 3 | | |
| Total | | 9 | 3 | 10 | | |



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| FOURTH YEAR | | | | | | |
|----------------|--------------------------------------|---------------|-----|--------|-------------------|----------------|
| First Semester | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| MexE 411 | MexE Seminars/Colloquium | 0 | 3 | 1 | 4th year standing | |
| MexE 412 | Advanced PLC and Systems Integration | 3 | 3 | 4 | MexE 407 | |
| MexE 413 | MexE Capstone Design 1 | 0 | 3 | 1 | ENGG 416 | |
| ENGG 406 | Engineering Management | 2 | 0 | 2 | | |
| IE 425 | Manufacturing and Quality Control | 3 | 0 | 3 | MATH 403 | |
| Fili 102 | Filipino sa Iba't Ibang Disiplina | 3 | 0 | 3 | | |
| MexEE 402 | MexE Elective 2 | 3 | 0 | 3 | MexEE 401 | |
| Total | | 14 | 9 | 17 | | |

| FOURTH YEAR | | | | | | |
|-------------------|------------------------|---------------|-----|--------|-------------------|----------------|
| Second Semester | | | | | | |
| Course Code | Course Title | No. of Hour/s | | Unit/s | Pre-requisite/s | Co-requisite/s |
| | | Lec | Lab | | | |
| Litr 102 | ASEAN Literature | 3 | 0 | 3 | | |
| ENGG 405 | Technopreneurship | 3 | 0 | 3 | 4th year standing | |
| MexE 414 | MexE Capstone Design 2 | 0 | 3 | 1 | Graduating | |
| ENGG 417 | On-the-Job Training | 320 hours | | 4 | 4th year standing | |
| Total | | 6 | 3 | 11 | | |
| GRAND TOTAL UNITS | | 157 | 84 | 189 | | |