The fully online Master of Science in Electronics Engineering curriculum comprises 30 credit units divided into nine (9) units of Core Courses, nine (9) units of Major Courses, six (6) units of Elective Courses, and six (6) units of Master’s Thesis.

- **No. of terms:** 6 terms
- **No. of units:** 30 units
  - Core courses: 3 courses, 9 units
  - Major courses: 3 courses, 9 units
  - Elective courses: 2 courses, 6 units
  - Master’s Thesis: 2 courses, 6 units

**Total: 12 Courses 30 Units**

### CORE COURSES

#### MATH220-1OL. ADVANCED ENGINEERING MATHEMATICS

The course deals with Power series solution, Bessel's functions, Fourier series, Fourier transform, Hilbert transform, solution of boundary and initial-value problems, algebra of vectors, vector integration, and vector application.

- **Credit:** 3 Units
- **Prerequisite:** None

#### MATH221-1OL. NUMERICAL METHODS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
The course deals with numerical solution to initial value and boundary value ODE problems, numerical solution to system of ordinary differential equations, finite difference methods, finite volume methods, and finite element methods.

Credit: 3 Units
Prerequisite: None

RES290-1OL RESEARCH TECHNIQUES

The course deals with research design, analysis and interpretation of data, basic research methods, and qualitative and quantitative research techniques.

Credit: 3 Units
Prerequisite: None

MAJOR COURSES

ECE221-OL. SIGNALS AND SYSTEMS

Continuous and discrete-time transform analysis, linear and time-invariant systems, transfer functions, Fourier transform, Laplace transform, z-transforms, digital sampling and aliasing, sampling and reconstruction, solutions to differential and difference equations using transforms, frequency response, Bode plots, and stability analysis.

Credit: 3 Units
Prerequisite: None

ECE222-OL. DIGITAL INTEGRATED CIRCUITS

The course covers CMOS devices and deep sub-micron manufacturing technology; CMOS of metrics: cost, reliability, performance, and power dissipation; sequential circuits, timing considerations, and locking approaches; design of large system blocks, including arithmetic, interconnect, memories, and programmable logic arrays; introduction to design methodologies, including hands-on experience.

Credit: 3 Units
ECE223-OL. ANALOG INTEGRATED CIRCUITS

The course covers topics Bipolar and MOS analog integrated circuit (IC) analysis and design. DC biasing for IC's, current sources, sinks and active loads, band gap references, input and output stages, Op Amp architectures, nonlinear analog IC's. Computer simulation of analog IC's.

Credit: 3 Units
Prerequisite: None

ELECTIVE COURSES

CPE201-OL. DIGITAL IC DESIGN

This course deals with the fundamentals of IC design as well as chip layout and simulation from frontend digital RTL design, synthesis and implementation, to digital physical / backend design and design for test (DfT) jobs. Topics include bipolar and MOS field effect transistor characteristics; VLSI fabrication techniques for MOS and bipolar circuits; calculation of circuit parameters from the process parameters; design of VLSI circuits such as logic, memories, charge-coupled devices, and A/D and D/A converters.

Credit: 3 Units
Prerequisite: None

CPE202-OL. ADVANCED COMPUTER SYSTEM ARCHITECTURE

The course covers the theory and life cycle the architecture and design of microcomputer systems utilizing microprocessors or microcontrollers; such as instruction set architectures, software interfaces, processor structures, memory hierarchy, and interfacing. The course emphasizes the subsystems of high performance computers: pipelining, instruction level parallelism, thread level parallelism, memory hierarchies, input/output, and network-oriented interconnections.
The course covers topics on consideration for design and application of digital systems, computer and computer-controlled equipment including the concepts and design of embedded systems, central processing unit issues, interrupt structures, as well as input/output technologies.

A course using programming language as a tool to describe the behavior or structure of digital circuits (ICs). Topics include design, programming and simulation of digital circuits using available HDL compilers like Verilog, VHDL, Abel HDL, etc.; basic concepts of HDL, data flow modelling, behavioral modelling, and advanced programming; and its practical applications in the design and simulation of a digital circuit.

This course covers topics such as physical system modelling and discrete system modelling of computer-controlled system using state variables and z-transform model representations with sampling theory and effects on digital control system. It also covers discussions on digital controllers needed in computer-controlled systems.

A course using programming language as a tool to describe the behavior or structure of digital circuits (ICs). Topics include design, programming and simulation of digital circuits using available HDL compilers like Verilog, VHDL, Abel HDL, etc.; basic concepts of HDL, data flow modelling, behavioral modelling, and advanced programming; and its practical applications in the design and simulation of a digital circuit.

This course covers topics such as physical system modelling and discrete system modelling of computer-controlled system using state variables and z-transform model representations with sampling theory and effects on digital control system. It also covers discussions on digital controllers needed in computer-controlled systems.
This course will introduce digital design techniques using Field Programmable Gate Array (FPGA). It will also tackle FPGA architecture with associated laboratory exercises in designing digital systems.

Credit: 3 Units  
Prerequisite: None

CPE214-OL. REAL TIME EMBEDDED SYSTEM

A course with real time application of embedded systems. It covers the characteristics of different applicable sensors as well as laboratory exercises using sensors and microcontrollers.

Credit: 3 Units  
Prerequisite: None

CPE215-OL. NEURAL NETWORKS

The course deals with the development of intelligent machines through the use of processing elements. Topics include configuration designs, connection schemes, and learning methodologies. Supplementary topics include self-organization, cognitive sciences and neural networks.

Credit: 3 Units  
Prerequisite: None

CPE217-OL. ADVANCED SOFTWARE ENGINEERING

The topics for the course include advanced theoretical concepts in software engineering and various issues of software development; group software development project spanning, project planning and management, analysis of requirements, construction of software architecture and design, implementation and quality assessment; and formal specification, component-based software engineering, maintenance and evolution.

Credit: 3 Units  
Prerequisite: None

CPE218-OL. ALGORITHMS IN VLSI DESIGN
The course covers the different topics available on design methodologies in VLSI automation tools such as high-level behavioral synthesis; performance and power-efficient algorithms in architectural synthesis and optimization including module selection, allocation, and scheduling; and system-level synthesis. The course also includes architectures and algorithms for the automatic design of systems-on-chip and embedded systems that include hardware/software partitioning, hardware/software synthesis, and software design under hardware constraints.

Credit: 3 Units
Prerequisite: None

CPE220-OL. SPECIAL TOPICS IN COMPUTER ENGINEERING

Current topics of interest in computer engineering; topic may vary from term to term depending on the interest of the instructor.

Credit: 3 Units
Prerequisite: None

ECE220-OL. MICROELECTRONICS DEVICES AND CIRCUITS

Characteristics of semiconductors; study of physical mechanisms and circuit modeling of solid-state electronic and photonic devices; principles of microelectronic processing and examples of integrated circuits.

Credit: 3 Units
Prerequisite: None

ECE224-OL. DYNAMIC SYSTEMS AND CONTROL

Linear, discrete-, and continuous-time, multi-input-output systems in control, least squares and matrix perturbation problems, state-space models, modes, stability, controllability, observability, transfer function matrices, poles and zeroes, minimality, internal stability of interconnected systems, feedback compensators, state feedback, optimal regulation, observers, observer-based compensators, measures of control
performance, robustness issues using singular values of transfer functions, and introduction to nonlinear systems.

**Credit:** 3 Units  
**Prerequisite:** None

**ECE226-OL. PROCESS CONTROL**

Feedback control, control system instrumentation, introduction to control system design, introduction to loop dynamics, tuning and control, PD controller design, tuning and troubleshooting, feed-forward control, intermediate control and advanced control strategies.

**Credit:** 3 Units  
**Prerequisite:** None

**ECE241-OL. COMPUTER-AIDED DESIGN OF INTEGRATED CIRCUITS**

Development of computer aids for integrated circuit design and state-of-the-art techniques and both the theoretical basis for the methods as well as the application of results to practical problems, including details of implementation. Topics to be covered include simulation, layout techniques, synthesis, verification, testing, and integrated design systems.

**Credit:** 3 Units  
**Prerequisite:** None

**ECE290-OL. SPECIAL TOPICS IN ELECTRONICS ENGINEERING**

Current topics of interest in Electronics Engineering: topic may vary from term-to-term depending on the interest of the professor

**Credit:** 3 Units  
**Prerequisite:** None

**EE220-OL. ECONOMIC OPERATION AND CONTROL OF POWER SYSTEMS**

A course on the economics of energy generation and utilization, optimization methods, mixed-generation dispatch, optimal load flow analysis, includes a study of synchronous
systems, prime movers, load frequency control and system voltage control; includes recent development.

Credit: 3 Units  
Prerequisite: None

EE220-OL. FAULT TOLERANT POWER SYSTEMS

A course on symmetrical components, sequence impedance of transmission lines, transformers and synchronous machines, sequence network, unbalanced and simultaneous faults calculations; includes recent developments.

Credit: 3 Units  
Prerequisite: None

EE249-OL. SMART GRID IN POWER SYSTEM

A course that deals with the study of smart grid as applied into the electric system integrating many types of generation and storage systems with a simplified interconnection process. It also describes the components of the grid and the tools needed to realize its main goals in communication systems, intelligent meters, and appropriate computer systems to manage the grid.

Credit: 3 Units  
Prerequisite: None

MASTER’S THESIS COURSES

ECE300-1OL MASTER’S THESIS 1

The first of the two-course series on research is primarily intended for students who will undertake independent research. A working paper culminates in a research proposal to include: problem statement, its rationale and importance, research methodology, tentative outline of contents, and bibliography. The proposal is submitted for assessment, review and acceptance by a panel of critics.
The second course on research requires the completion of a thesis based on proposed and accepted research topic. The completed thesis must be defended to a panel and a final written report must be submitted for approval. The final thesis document may be published to a Scopus-Indexed Journal or Conference Proceedings.

Credit: 3 Units  
Prerequisite: ECE300-1OL

**PROGRAM SCHEDULE**

**Year 1**

1st Quarter: Numerical Methods for Ordinary and Partial Differential Equations, Signals and Systems

2nd Quarter: Advanced Engineering Mathematics, Analog Integrated Circuit

3rd Quarter: Research Techniques, Digital Integrated Circuit

4th Quarter: Elective 1, Elective 2

**Year 2**

1st Quarter: Master’s Thesis 1

2nd Quarter: Master’s Thesis 2

For the Electives Courses (The students can choose the elective courses in the list below):

1. Microelectronics and Devices  
2. Dynamic Systems and Controls  
3. Process Controls  
5. Special Topics in Electronics Engineering  
6. Digital IC Design
7. Advanced Computer Systems Architecture
8. Design of Digital Systems and Computers
9. Advanced Software Engineering
10. Hardware Description Language (HDL)
11. Real Time Embedded System
12. Digital ASIC Design with FPGA
13. Neural Networks
15. Special Topics in Computer Engineering
16. Economic operation and control of power systems
17. Fault tolerant power systems
18. Smart Grid Power System

**PROGRAM COST**

Promotional cost per unit is **Php 2,500** (all inclusive rate).

**FAQS**

**What Background is necessary for the MS ECE program?**

The MS ECE is designed for undergraduates with a degree in Electronics Engineering, Electronics and Communications Engineering, Computer Engineering and Electrical Engineering.

**How do I apply for the program?**

Applicants need only to fill out the online application form and to submit scanned copies of their transcript of records, two recommendation letters, and an English language proficiency certification – TOEFL, TOEIC, IELTS or equivalent (for foreign students) here.

Original copies of the requirements must be sent to the registrar at:

Office of the University Registrar
Mapúa University
Graduates from abroad must submit the original copies of requirements authenticated by the Philippine Consulate General (with red ribbon and seal).

**How many course units are required to complete the program?**

A student should earn 30 course units to complete the MSECE program and earn the degree.

**How quickly can I complete the program?**

As Mapúa University’s Academic Year follows a quarter system, a student can complete the MSECE program in six (6) quarters, subject to other graduation requirements.