



UNIVERSITY OF THE EAST  
Graduate School  
Manila

| <b>Master of Engineering Science</b> |   |              |
|--------------------------------------|---|--------------|
|                                      | <b>Core</b>   | <b>Units</b> |
| GEN 7101                             | Test and Measurement  | 3            |
| GEN 7102                             | Advanced Engineering Mathematics  | 3            |
| GEN 7103                             | Advanced Physics 1 (Classical Mechanics)  | 3            |
| GRR 7501                             | Statistical Methods Applied to Research   | 3            |
|                                      |   | <b>12</b>    |
|                                      | <b>Major</b>  |              |
| GEN 7104                             | Optimization  | 3            |
| GEN 7105                             | Linear Algebra and Matrix Theory  | 3            |
| GEN 7107                             | Numerical Analysis  | 3            |
| GEN 7108                             | Advanced Physics 2 (Electromagnetics)   | 3            |
| GEN 7109                             | Advanced Physics 3 (Optics)   | 3            |
| GEN 7200                             | Advanced Physics 4 (Modern Physics)   | 3            |
|                                      |   | <b>18</b>    |
|                                      | <b>Elective</b>   |              |
| GEN 7201                             | Computational Modelling and Simulations   | 3            |
| GEN 7202                             | Computer-Aided Physics  | 3            |
| GEN 7203                             | Strategies in Teaching Math/Physics   | 3            |
| GEN 7204                             | Scientific Computation and Programming  | 3            |
| GEN 7205                             | Mathematical Analysis for Teachers  | 3            |
| GEN 7206                             | Materials Science   | 3            |
|                                      |   | <b>6</b>     |
| GRR 8700                             | Comprehensive Examination<br><b>At least one (1) publication in refereed journal<br/>or juried creative work.</b> |              |
|                                      | <b>Total</b>  | <b>36</b>    |

\*Approved by the University of the East Board of Trustees on March 23, 2017, initial offering in the First Semester 2017-2018.

\*\* Government Permit 001, 2008

\*\*\* Government Recognition 2017

## CORE

### **GEN 7101 Test and Measurement**

Historical development of test measurement, functions and qualities of good measuring instruments, different steps in constructing teacher-made tests and improving reliability of test instruments (3 units)

### **GEN 7102 Advanced Engineering Mathematics**

Ordinary differential equations (ODE's) and partial differential equations (PDE's); methods of solving ODE's and PDE's; Fourier analysis, Laplace transforms; special functions; complex analysis. (3 units)

### **GEN 7103 Advanced Physics 1 (Classical Mechanics)**

Newtonian dynamics; Lagrangian and Hamiltonian dynamics; canonical transformations; Hamilton-Jacobi theory; perturbation theory; introduction to continuous media and advance linear dynamics. (3 units)

### **GRR 7501 Statistical Methods Applied to Research**

Fundamentals of statistics as applied to master's degree research, including population, sample, parameter, statistics, and variable; the branches of statistics, sources of data, sampling concepts, sample selection methods; analysis and interpretation of data using statistics software (3 units)

## MAJOR

### **GEN 7104 Optimization**

Optimization is the determination of the extreme points of a function. The lowest points are called minima and for some cases the function may have highest points or maxima. In economics, optimization means to maximize profits or revenues or to minimize total costs. Topics include the calculation of relative maximum and minimum of multivariable functions using derivative tests and the use of the method of Lagrange Multipliers. Formulate and solve linear programming problems with and without constraints using the graphical method, the simplex method, matrix and mat lab solvers. Apply various methods in discrete optimization, nonlinear optimization, convex optimization, and optimal control theory. Apply optimization methods in agriculture, manufacturing, scheduling, business, economics and mathematics education, optics and classical mechanics. (3 units)

### **GEN 7105 Linear Algebra and Matrix Theory**

Vector spaces; matrices; eigenvalues and eigenvectors; linear transformations; canonical forms; orthogonality; applications (3 units)

### **GEN 7107 Numerical Analysis**

Solutions of ordinary differential equations and nonlinear differential equations by numerical methods; solutions of partial differential equations; finite difference method and finite element method (3 units)

### **GEN 7108 Advanced Physics 2 (Electromagnetics)**

Electrostatics in vacuum and in dielectric media; boundary-value problems; electrodynamics; magnetostatics; magnetodynamics; Maxwell's equations; plane electromagnetic waves; covariant electrodynamics. (3 units)

### **GEN 7109 Advanced Physics 3 (Optics)**

Optics of planar surfaces; interference; far-field diffraction; Fourier optics; temporal and spatial coherence, polarization (3 units)

### **GEN 7200 Advanced Physics 4 (Modern Physics)**

Special theory of relativity; old quantum theory; Schrodinger's equation and elementary wave mechanics; one-electron atoms, the hydrogen atom, singly-ionized helium; multi-electron atoms, Paul exclusion principles, radioactivity and nuclear physics. (3 units)

## ELECTIVE

### **GEN 7201 Computational Modelling and Simulation**

Algorithms for numerical solution; Euler and Runge-Kutta methods; stochastic and deterministic methods of simulating physical systems; numerical integration of functions using Monte Carlo techniques; simulation of multi-particle relaxation and two-level systems; Boltzmann entropy; chaotic motion; random walks simulation; Heat Bath algorithm; Monte Carlo (MC) simulation of quantum systems; classical and quantum molecular dynamic (MD) simulations. (3 units)

**GEN 7202 Computer-Aided Physics:**

Different ways in which information and communication technology (ICT) is used in higher education, in particular how the computer supports teaching and learning physics; design and development of computer aided instructions, and simulations. (3 units)

**GEN 7203 Strategies in Teaching Math/Physics**

An overview of the different teaching approaches and strategies in teaching mathematics and physics; critical thinking and inquiry approach; group discussions, activity- based and cooperative learning; constructivist approach in developing and rectifying concepts; Web-based, internet-based and e-learning as new approaches in learning and teaching. (3 units)

**GEN 7204 Scientific Computation and Programming**

Integrated approach using C/Java programming language and computational methods and techniques using MATLAB (3 units)

**GEN 7205 Mathematical Analysis for Teachers**

Functions and graphs; series and sequences; differentiation and integration; partial differentiation; vector and tensor analysis; differential equations (3 units)

**GEN 7206 Materials Science**

Materials classification and physical properties, theory and applications (3 units)

**GRR 7700 Comprehensive Examinations**

Prerequisite: Completion of all course work (0 Units)

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