As of 20 July 2020

COLLEGE OF SCIENCE
MATERIALS SCIENCE AND ENGINEERING PROGRAM
LIST OF COURSES

201 [a] **Fundamentals of Materials Science and Engineering**.
Materials classification, properties and applications; principles of processing: raw materials for the Philippine industry. Prereq: COI. 3h. 3u.

211 [a] **Laboratory Module in Transmitted Light Microscopy**.
Prereq: COI. 3 h. (lab) 1 u.

212[a] **Laboratory Module in Mineragraphy**.
Prereq: COI. 3 h. (lab) 1 u.

213 [a] **Laboratory Module in Crystallography**.
Prereq: COI. 3 h. (lab) 1 u.

214 [a] **Laboratory Module in Vacuum Tech & Thin Film Deposition**.
Prereq: COI. 3 h.

215 [a] **Laboratory Module in Electronic & Magnetic Measurement**.
Prereq: COI. 3 h. (lab) 1 u

216 [a] **Laboratory Module in Ceramics Processing & Characterization**.
Prereq: COI. 6h. (lab) 2 u

217 [a] **Laboratory Module on Scanning Electron Microscopy**.
Prereq: COI 3h. (lab) 1u.

218 [a] **Laboratory Module in Metallography**.
Prereq: COI. 3h. (lab) 1u.

219 [a] **Laboratory Module on Thermal Analysis**.
Prereq: COI. 3h. (lab) 1u.

225 [a] **X-Ray Crystallography and Spectrography.**
X-ray methods for the characterization of crystal structure and determination of chemical composition. Prereq: COI. 3h. 3u.

231 [a] **Thermodynamics of Materials.**
Theory of thermodynamics: applications to phase equilibria. Prereq: COI. 3h. 3u.

233 [a] **Kinetics of Materials.**
Reaction rates, mechanisms, and transport phenomena in materials. Prereq: COI. 3h. 3u.

241 [a] **Physics of Solids.**
Band theory of solids and lattice vibrations; electrical, magnetic and optical properties.
Prereq: COI. 3h. 3u.

243 **Epitaxial Growth**.
Processing and preparation of semiconducting materials & related compounds, microstructures, and devices with emphasis on the principles of epitaxial growth fronts. Prereq: 241. 3h. 3u.

243.1 **Epitaxial Growth Laboratory**.
Prereq: MSE 243. 6h. (lab) 2u.

245 **SemiConductor Characterization**.
Advanced Methods of evaluating semiconductor materials, microstructures and devices including electronic analysis, spectroscopy, x-ray diffraction and surface analysis. Prereq: MSE 241. 3h. 3u.

245.1 **245.1 Semi-Conductor Characterization Laboratory**.
Prereq: MSE 245. 6h. (lab) 2u.

251 **Mechanical Properties of Solids.**
Mechanisms of deformation and fracture mechanics; failure of materials and strengthening mechanism; plastic deformation, processing, tools and equipment. Prereq: COI. 3h. 3u.

253 **Heat Treatment of Ferrous and Special Alloys**.
Types of ferrous alloys; interrelationships among compositions, microstructure, service requirements and mechanical properties of ferrous alloys; industrial heat treatment practices; special alloys.Prereq: COI. 3h 3u.

255 **Metal Casting**.
Metallurgy of cast metals; unit foundry operations, sand testing and control, melting and casting practices; manufacture of special cast metals and alloys. Prereq: COI. 3h. 3u

265 **Ceramic Materials**.
Structure and properties: synthesis and processing of ceramics; high technology and engineering applications. Prereq: MSE 241. 3h. 3u.

266 **Polymer Materials**.
Structure, properties, and synthesis of polymers; processing and conversion to plastics; applications and performance of polymers. Prereq: COI. 3h. 3u.

267 **Surface Science**.
Surface and interfaces; thermodynamics and electrical aspects of surfaces and interfaces; adsorption; chemisorption; catalysis; colloidal systems; applications to processing and manufacturing. Prereq: MSE 231. 3h. 3u.

268 **Degradation of Materials.**
Degradation of materials, and effects of the environment on, metals, polymers, ceramics, and composites. Prereq: MSE 231. 3h. 3 u

271 Physics of Liquid Crystals.
Study of anisotropic fluids: main types and properties; long and short order in nematics; principles of the main field (Maier-Sanpe) and the continuum theories, static and dynamic properties of nematics, cholesterics and smectics; applications of liquid crystals. Prereq: COI. 3h. 3 u

271.1 Applied Liquid Crystals I.
Characterization of LCs: optical microscopy; refractometry; uv-vis-ir spectrophotometry; FTIR; differential scanning calorimetry. Prereq: MSE 271. 6 h. (lab) 2 u

271.2 Applied Liquid Crystals II.
Synthesis of LCs; fabrication of polymer dispersed liquid crystals (PDLC) fabrication; characterization and applications in simple LC devices. Prereq: MSE 271.1. 6 h. (lab) 2 u

275 Advanced Physics of Solids I.
Fundamental principles of the physics of solids: periodic structure, lattice waves, electron states; static properties of solids; electron-electron interaction; dynamics of electrons in solids. Prereq: MSE 241. 3h. 3 u

276 Advanced Physics of Solids II.
Transport and optical properties of solids, Fermi surface, magnetism, superconductivity, amorphous and disordered systems. Prereq: MSE 275. 3h. 3 u

281 Dislocation Theory.
Foundations of dislocation theory; dislocation movements, forces, interactions; role of dislocations in strengthening mechanisms in solids. Prereq: MSE 241. 3h. 3 u.

283 Semiconductor Materials Processes.
Substrate materials preparation; physics of semiconductors; device fabrication technologies; packaging and encapsulation. Prereq: MSE 241. 3h. 3 u.

283.1 Semiconductor Device Fabrication Laboratory.
Prereq: MSE 283. 6h. (lab) 2 u.

285 Electron Microscopy.
Techniques for transmission and scanning electron microscopy; secondary and back-scattered electron imaging; microchemical and microstructural analysis. Prereq: MSE 217 3h. 3u

286 Powder Technology.
Problems associated with forming powders into shapes; powder characterization; processes of sintering and vitrification; operations of grinding, finishing and coating. Prereq: MSE 241. 3 u.

287 Crystal Growth.
Application of thermodynamics and phase diagrams to crystal growth; segregation; nucleation; techniques and choice of method for a specific material. Prereq: MSE 231. 3 u.

287.1 **Crystal Growth Laboratory.**
Prereq: MSE 287. 6 h. (lab) 2 u.

298 **Special Problems**.
Prereq: COI. 3u. May be taken more than once provided topics are different.

296 **Graduate Seminar.**
Prereq: COI. 1 u.

300 **MS Thesis.**
Prereq: Consent of Adviser. 6 u

400 **PhD Dissertation.**
Prereq: Passing of the Candidacy Examination. 12 u

[a] *6 units of Laboratory Modules in MSE (i.e. MSE 211-219) are required*