Degree: Doctor of Philosophy (Materials Engineering)
Ph.D. (Materials Engineering)

Curriculum Structure: Plan 1.1
The degree of Doctor of Philosophy (Materials Engineering) consists of 48 credits, including 48 credits of doctoral thesis and at least 7 credits auditing of major taught courses.
1. Minimum of 7 credits auditing of major taught courses composing of:
   11 4 credits of seminar
   12 3 credits of core major courses
2. Minimum of 48 credits in a doctor thesis

Course List
1. Minimum of 7 credits auditing of major taught courses
   11 4 credits of seminar
      01213697 Seminar 1111
   12 3 credits of core major courses
      01213691 Advanced Research Methods in Materials Engineering 3(236)

2. Minimum of 48 credits in a doctor thesis
   01213699 Thesis 148

Curriculum Structure: Plan 1.2
The degree of Doctor of Philosophy (Materials Engineering) consists of 72 credits, including 72 credits of doctoral thesis and at least 9 credits auditing of major taught courses.
1. Minimum of 9 credits auditing of major taught courses composing of:
   11 6 credits of seminar
   12 3 credits of core major courses
2. Minimum of 72 credits in a doctor thesis
Course List

1. Minimum of 9 credits auditing of major taught courses
   11 6 credits of seminar
   01213697 Seminar 1,1,1,1,1
   12 3 credits of core major courses
   01213691 Advanced Research Methods in Materials Engineering 3(236)

2. Minimum of 72 credits in a doctor thesis
   01213699 Thesis 1-72

Curriculum Structure: Plan21

The degree of Doctor of Philosophy (Materials Engineering) consists of 48 credits, including 36 credits of doctoral thesis and at least 12 credits of major taught courses.

1. Minimum of 12 credits of major taught courses composing of
   11 4 credits of seminar
   12 3 credits of core major courses
   13 5 credits of elective major courses

2. Minimum of 36 credits in a doctor thesis

Course List

1. Minimum of 12 credits of major taught courses
   11 4 credits of seminar
   01213697 Seminar 1,1,1,1
   12 3 credits of core major courses
   01213691 Advanced Research Methods in Materials Engineering 3(236)
   13 5 credits of elective major courses
   01213611 Advanced Materials Characterization 3(306)
   01213621 Modern Metallurgy 3(306)
   01213631 Advanced Crystallography of Materials 3(306)
   01213641 Computational Simulation in Advanced Polymer Processing 3(306)
   01213666 Selected Topics in Materials Engineering 1-3
   01213698 Special Problems 1-3

2. Minimum of 36 credits in a doctor thesis
   01213699 Thesis 1-36
Curriculum Structure: Plan 22

The degree of Doctor of Philosophy (Materials Engineering) consists of 72 credits, including 48 credits of doctoral thesis and at least 24 credits of major taught courses.

1. Minimum of 24 credits of major taught courses composing of
   1.1 6 credits of seminar
   1.2 10 credits of core major courses
   1.3 8 credits of elective major courses

2. Minimum of 48 credits in a doctor thesis

Course List

1. Minimum of 24 credits of major taught courses
   11 6 credits of seminar
   01213397 Seminar 1,1,1,1,1
   12 10 credits of core major courses
   01213513 Thermodynamics and Kinetics of Materials 4(408)
   01213514 Materials Characterization in Research 3(306)
   01213591 Research Methods in Materials Engineering (auditing)
   01213891 Advanced Research Methods in Materials Engineering 3(236)
   13 8 credits of elective major courses
   Enroll in at least 8 credits in the following courses, of which at least 5 credits should be
   012136xx
   01213522 Advanced Metallurgical Extraction Technology 3(306)
   01213523 Advanced Welding Technology 3(306)
   01213524 Corrosion Failure Analysis and Prevention 3(306)
   01213526 Advanced Powder Metallurgy 3(306)
   01213527 Alloy Technology 3(306)
   01213528 Fatigue and Surface Optimization 3(306)
   01213529 Advanced Mechanical Behavior of Materials 3(306)
   01213531 Bioceramics 3(306)
   01213522 Advanced Electroceramic Materials 3(306)
   01213533 Crystallography of Materials 3(306)
   01213534 Materials for High Temperature Applications 3(306)
   01213545 Polymer Physics 3(306)
   01213546 Inorganic and Organometallic Polymers 3(306)
   01213547 Mechanical Properties of Solid Polymers 3(306)
Engineering

- 01213548 Degradation of Polymer 3(30.6)
- 01213549 Biopolymers 3(30.6)
- 01213551 Advanced Composite Materials 3(30.6)
- 01213552 Nanoengineering 3(30.6)
- 01213553 Advanced Biomaterials 3(30.6)
- 01213555 Advanced Metal Processing 3(30.6)
- 01213566 Advanced Ceramics Processing 3(30.6)
- 01213567 Advanced Polymer Processing and Rheology 3(30.6)
- 01213568 Microelectronic and Microsystem Technology and Fabrications 3(30.6)
- 01213569 Electrochemical Engineering for Industrial Materials and Waste Management 3(30.6)
- 01213577 Product Life Cycle Design and Management for Materials Engineer 3(30.6)
- 01213578 Industrial Organization and Management for Materials Engineer 3(30.6)
- 01213579 Quality Engineering Analysis for Materials Engineer 3(30.6)
- 01213581 Advanced Materials Characterization 3(30.6)
- 01213582 Modern Metallurgy 3(30.6)
- 01213583 Advanced Crystallography of Materials 3(30.6)
- 01213584 Computational Simulation in Advanced Polymer Processing 3(30.6)
- 01213585 Selected Topics in Materials Engineering 1-3
- 01213586 Special Problems 1-3

2. Minimum of 48 credits in a doctoral thesis

- 01213699 Thesis 148
Course Description

01213513 Thermodynamics and Kinetics of Materials 4(408)

01213514 Materials Characterization in Research 3(306)

01213522 Advanced Metallurgical Extraction Technology 3(306)
Extraction technology, decompositions of each type of metals, industrial extraction of metals, and metal recycling.

01213523 Advanced Welding Technology 3(306)
Welding technology, characteristics of fusion, physical metallurgy of welds, failure of welded structures, failure control and prevention in welds, joining of steels, joining of non-ferrous metals, advanced technology in welding, reliability of welded structures, behaviors of welds in service.

01213524 Corrosion Failure Analysis and Prevention 3(306)

01213526 Advanced Powder Metallurgy 3(306)
Alloy Technology


Fatigue and Surface Optimization


Advanced Mechanical Behavior of Materials


Bioceramics


Advanced Electroceramic Materials


Crystallography of Materials

Crystal structures concepts. Crystal structures classifying. Symmetry in crystal structures. Relationships between crystal structures and mechanical, electrical, optical, and magnetic properties of materials.

Materials for High Temperature Applications

Selections of materials for high temperature applications, mechanical behavior, physical metallurgy of superalloys, high temperature ceramics.

Polymer Physics

Mechanisms of polymerization and characterizations of inorganic and organometallic polymers.

Mechanical Properties of Solid Polymers

Degradation of polymer
Degradation of polymer by heat, light, oxidation, high energy radiation, photo-oxidation, mechanical force, microorganism, and special environment.

Biopolymers

Advanced Composite Materials
Processing and design of composite materials, fiber composites, chemical and physical processes.

Nanoengineering
Definition, history and advances in nanoscale science and engineering. Characterization techniques and properties of nanoscale materials. Production processes, applications and examples of nanoscale devices, emphasizing the relationship between structures, properties and applications.

Advanced Biomaterials
Advanced Metal Processing 3(306)

Advanced Ceramics Processing 3(306)

Advanced Polymer Processing and Rheology 3(306)

Microelectronic and Microsystems Technology and Fabrications 3(306)

Electrochemical Engineering for Industrial Materials and Waste Management 3(306)
Product Life Cycle Design and Management for Materials Engineer


Industrial Organization and Management for Materials Engineer

Internal organization, managerial controls, industrial risk and forecasting. Financing industrial enterprise product, research and development, production planning, physical facilities, production and materials control, method improvement, personal management, marketing, advertising and sales promotion, cost control.

Quality Engineering Analysis for Materials Engineer

Quality engineering concept, product design and specification, process design and planning, design of experiment, materials inspection and testing, measurement tools calibration, failure analysis, quality improvement, failure mode and effect analysis, management system in inspection and testing laboratory.

Research Methods in Materials Engineering

Principles and research methods in materials engineering. Problem analysis for research topic identification, data collection for research planning. Identification of samples and techniques. Analysis, interpretation and discussion of research result; report writing for presentation and publication.

Advanced Materials Characterization

Materials Engineering

012362   Modern Metallurgy 3(36)

012361   Advanced Crystallography of Materials 3(36)

012360   Computational Simulation in Advanced Polymer Processing 3(36)

012359   Advanced Research Methods in Materials Engineering 3(36)
Advanced research materials engineering and preparation of research proposal, application of information technology and computer data processing and retrievals, data analysis, article writing and presentation, group discussion. Paper preparation for presentation and publication.

012356   Selected Topic in Materials Engineering 1-3
Selected topic in materials engineering at the doctoral degree level. Topics are subject to change each semester.

012357   Seminar 1
Presentation and discussion on interesting topics in materials engineering at the doctoral degree level.

012358   Special Problems 1-3
Study and research in materials engineering at the doctoral degree level and compile into a written report.

012359   Thesis 1-72
Research at the doctoral degree level and compile into a thesis.