This version of the curriculum is applicable to students admitted during the academic years 2025–2029.

Doctor of Philosophy Program in Materials Science and Engineering (International Program)

2.2: Research and Coursework (5-year program) MSE

Total Credits of the Program No less than 73 Credits

Curriculum Structure

1) Core Courses **No less than 25 Credits**

1.1) Seminar **No less than 4 Credits**

- MSE 578 Seminar I (GD) 1(---)
- MSE 579 Seminar II (GD) 1(---)
- MSE 678 Seminar III (GD) 1(---)
- MSE 679 Seminar IV (GD) 1(---)

1.2) Graduate Development Courses **6 Credits (non-Credits)**

- VIS 661 Professional Development I (SU) 3(3-0-6) (non-credit)
- VIS 662 Professional Development II (SU) 3(3-0-6) (non-credit)

1.3) Compulsory Core Courses **12 Credits**

- MSE 501 Thermodynamics and Kinetic Processes in Materials (GD) 3(3-0-6)
- MSE 502 Chemical Synthesis of Materials (GD) 3(3-0-6)
- MSE 503 Structure and Properties of Materials (GD) 3(3-0-6)
- MSE 504 Characterization of Materials (GD) 3(3-0-6)

1.4) Elective Core Courses* **9 Credits**

*Total not less than 9 credits, of which no less than 6 credits can be chosen from courses in the MSE field of study. The remaining 3 credits can be chosen from the courses in the MSE field of study or outside the MSE field of study. The approval of the program coordinator or school director is required if students select the elective courses not listed below.

1.4.1) Frontiers in Materials Science and Engineering

- MSE 512 Solid State Chemistry and Physics (GD) 3(3-0-6)
- MSE 515 Modeling and Simulation of Materials (GD) 3(3-0-6)
- MSE 611 Surface and Interface Properties of Materials (GD) 3(3-0-6)
- MSE 612 Electronic Structures of Solid Surface and Nano-scale Materials (GD) 3(3-0-6)
- MSE 615 Molecular Structures and Properties of Polymers (GD) 3(3-0-6)
- MSE 616 Chemistry and Physics of Nanostructures (GD) 3(3-0-6)
- MSE 617 Electrochemistry and Corrosion (GD) 3(3-0-6)
- MSE 619 Frontiers in Materials Science and Technology (GD) 3(3-0-6)
- BSE 612 Biocatalysis and Mechanistic Enzymology (GD) 3(3-0-6)
- CHE 612 Electrochemical Energy Systems (GD) 3(3-0-6)

1.4.2) Specialized Courses on Molecular Design and Synthesis Processes

MSE 521 Advanced Synthesis for Organic and Inorganic and Biological Materials (GD)	3(3-0-6)
MSE 522 Synthesis and Processing of Electronic and Photonic Materials (GD)	3(3-0-6)
MSE 523 Ceramic Processing (GD)	3(3-0-6)
MSE 525 Electrochemical Processing of Materials (GD)	3(3-0-6)
MSE 526 Rheology and Processing of Polymers (GD)	3(3-0-6)
MSE 621 Composite Materials and Processing (GD)	3(3-0-6)
MSE 624 Molecular Design of Functional Polymers (GD)	3(3-0-6)
MSE 627 Qualitative Property Predictions for Transition Metal Complexes (GD)	3(3-0-6)
CHE 521 Applied Catalysis (GD)	3(3-0-6)
CHE 522 Design and Preparation of Heterogeneous Catalysts (GD)	3(3-0-6)
CHE 622 Quantum Simulation of Molecules and Materials (GD)	3(3-0-6)
CHE 623 Advanced Catalysis and Electrocatalysis (GD)	3(3-0-6)
CHE 624 Industrial Catalysis (GD)	3(3-0-6)

1.4.3) Advanced Courses on Cutting-Edge Analysis and Characterization of Materials

MSE 532 Electron Microscopy and Diffraction (GD)	3(3-0-6)
MSE 631 X-ray Science and Applications (GD)	3(3-0-6)
MSE 634 Spectroscopic Methods for Organic Compounds (GD)	3(3-0-6)

1.4.4) Novel Materials, New Processes and Applications

MSE 541 Materials for Energy Environmental and Biological Applications (GD)	3(3-0-6)
MSE 542 Photovoltaic and Solar Cell Materials and Devices (GD)	3(3-0-6)
MSE 543 Sensor and Transducer Materials and Technology (GD)	3(3-0-6)
MSE 544 Advanced Ceramics and Applications (GD)	3(3-0-6)
MSE 545 Catalytic Materials and Applications (GD)	3(3-0-6)
MSE 642 Nano Electronic and Photonics Materials and Devices (GD)	3(3-0-6)
MSE 643 High-Performance Structural Materials (GD)	3(3-0-6)
MSE 644 Composite and Hybrid Materials (GD)	3(3-0-6)
MSE 645 Biomaterials and Soft Materials (GD)	3(3-0-6)
MSE 646 Thin-Film Semiconductors and Devices (GD)	3(3-0-6)
MSE 667 Selected Topics: "Advanced NMR Analysis" (GD)	3(3-0-6)
MSE 667 Selected Topics: "Coordination and Organometallic Chemistry" (GD)	3(3-0-6)
MSE 667 Selected Topics: "Solid State Chemistry" (GD)	3(3-0-6)
MSE 667 Selected Topics: "Functional Porous Materials and Periodic Structures" (GD)	3(3-0-6)

BSE 642 Biosensor and Electrochemistry (GD)	3(3-0-6)
CHE 696 Selected Topics: "Advanced Materials" (GD)	3(3-0-6)
CHE 696 Selected Topics: "Advanced Zeolites in Catalysis" (GD)	3(3-0-6)
CHE 696 Selected Topics: "Crystallization" (GD)	3(3-0-6)
CHE 696 Selected Topics: "Solid State Chemistry I" (GD)	3(3-0-6)
CHE 696 Selected Topics: "Solid State Chemistry II" (GD)	3(3-0-6)

1.4.5) Other Compulsory Elective Courses

MSE 667 Selected Topics: "Critical Thinking and Effective Communication" (GD)	3(3-0-6)
CHE 611 Electrochemical Engineering (GD)	3(3-0-6)
CHE 696 Selected Topics: "Material Chemistry: Metal-Organic Frameworks - Characterization and Applications" (GD)	3(3-0-6)
CHE 696 Selected Topics: "Molecular Electrochemistry for Energy" (GD)	3(3-0-6)

2) Thesis **No less than** **48 Credits**

MSE 699 Thesis (SU)	1-48