Materials Science and Technology Major Requirements/Checklist

All courses counted towards the MSTC major requirements must be taken for a letter grade (when offered) and passed with a grade of C- or better.

Foundation courses (38-41 credits)

General Chemistry Honors Sequence: CH 224H _____ CH 225H _____ CH 226H _____
Prerequisites for CH 224H: Satisfactory placement score and MATH 112Z
OR General Chemistry Sequence: CH 221/2/3 (by petition)
Prerequisites for CH 221: CH 111 or satisfactory placement score and MATH 111Z

Physics with Calculus Sequence:
PHYS 251 _____ PHYS 252 _____ PHYS 253 _____
OR Foundations of Physics Sequence: PHYS 201/2/3 (by petition)
Prerequisite for PHYS 201/251: MATH 112Z or equivalent

Three terms of general physics/chemistry laboratory:
PHYS 204/5/6 OR PHYS 290 (3 terms) OR CH 227/8/9
Course 1 _____ Course 2 _____ Course 3 _____

Fundamentals of Materials in Technology Sequence: MSTC 231 _____ MSTC 232 _____

Research Immersion: CH 329 _____

Application into undergraduate Materials Science and Technology program (after completing Foundation courses)

- Application components: transcripts, choice of emphasis (Physics or Chemistry), preference for research area (for match with faculty mentor)
- Guaranteed admission: GPA of 3.0 or better in Foundation courses
- If grade cutoff is not met – application review based on academic performance + additional application components: CV, short answer essays, instructor recommendation letter(s)

Mathematics and computation (28 credits)

Calculus Sequence: MATH 251 _____ MATH 252 _____ MATH 253 _____
Prerequisite for MATH 251: MATH 112Z or satisfactory placement score

Differential Equations: MATH 256 _____
Prerequisite: MATH 253

Multivariable Calculus: MATH 281 _____
Prerequisite: MATH 253

Linear Algebra: MATH 341 _____
Prerequisite: MATH 252

Advanced Mathematics/Computation elective: one course from the following list

Course _____

- MATH 282 Multivariable Calculus II
- PHYS 389 Mathematical Methods
- MATH 420/1/2 Partial Differential Equations
- Computer Science CIS 210/1/2

Other courses that meet advanced math/computation requirements may be requested by petition

Fundamentals of Materials Science (24 credits)

Students are expected to follow the physics or chemistry emphasis; courses from different emphases may be mixed by petition as long as all categories/prerequisites are fulfilled.

The requirement of eight Advanced Lab credits may be partially met by undergraduate research credits (PHYS 401, PHYS 491/2/3, CH 401) instead of the courses listed.

Physics emphasis

Quantum mechanics, Thermodynamics and Statistical Mechanics sequence:

PHYS 351 _____ PHYS 352 _____ PHYS 353 _____

Organic Chemistry: CH 341 _____ (non-major course CH 331 may be substituted)

Prerequisite: CH 223 or CH 226H

Advanced Lab: Two courses from the following list

Course 1 _____ Course 2 _____

- DSCI 101 Data Science Fundamentals
- PHYS 391 Physics Experimentation Data Analysis Laboratory
- PHYS 431 Analog Electronics
- PHYS 432 Digital Electronics
- PHYS 481 Design of Experiments

Chemistry emphasis

Organic Chemistry: CH 341 _____ (non-major course CH 331 may be substituted)

Prerequisite: CH 223 or CH 226H

Thermodynamics: CH 411 _____

Prerequisites: PHYS 201/2/3 or 251/2/3; MATH 253

Advanced Chemistry Sequence:

Organic Chemistry: CH 342 _____ CH 343 _____ (non-major 335/6 may be substituted)

OR

Physical Chemistry: CH 412 _____ CH 413 _____

Advanced Lab Sequence (choose the sequence corresponding to the course selection)

Organic Chemistry Lab Sequence: CH 337 _____ CH 338/348 _____

OR

Physical Chemistry Lab Sequence: CH 417 _____ CH 418 _____

Materials Science and Technology core (16 credits)

Thermodynamics, Kinetics and Transport in Advanced Materials: MSTC 431 _____ MSTC 432 _____
Prerequisites for MSTC 431: MSTC 232, PHYS 352 or CH 411, MATH 256, MATH 281

Electronic, Optical, and Magnetic Properties of Materials: MSTC 441 _____ MSTC 442 _____
Prerequisites for MSTC 441: PHYS 253, MSTC 431, MATH 256, MATH 281/2

Upper-division elective courses (12 credits)

Three upper division or graduate level materials science, chemistry or physics courses on top of the courses outlined above. Courses are expected to be 400 level or above. Sample courses are listed by subject area below, but other courses may be added by petition.

Course 1 _____
Course 2 _____
Course 3 _____

Applied materials physics
- PHYS 412
- PHYS 413
- PHYS 422
- PHYS 414
- PHYS 415
- PHYS 417
- PHYS 424
- PHYS 425
- PHYS 672

Organic-inorganic materials chemistry
- CH 420
- CH 421
- CH 431
- CH 432
- CH 433
- CH 447

Physical materials chemistry
- CH 429
- CH 441
- CH 442
- CH 443
- CH 444
- CH 445
- CH 446
- CH 447

Graduate courses from the Electrochemistry, Quantum Technologies, or KCGIP Masters programs