

# 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**