



**Recommended Academic Plan for Physics/Nanotechnology - Materials major/option
(at University Park) – Nanotechnology ‘track’
Last updated Spring 2012**

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| <p>PHYS 211 General Physics: Mechanics (4) MATH 140 (GQ) Calculus with Analytic Geometry I (4) CHEM 110 (GN) Chemical Principles I (3) CHEM 111 (GN) Experimental Chemistry I (1) ENGL 015/020 (GWS) Rhetoric and Composition (3) <u>or</u> AHS elective (3) Physics First Year Seminar (1) 16 credits</p> | <p>PHYS 212 General Physics: E&M (4) MATH 141 (GQ) Calculus with Analytic Geometry II (4) CHEM 112 (GN) Chemical Principles II (3) CHEM 113 (GN) Experimental Chemistry II (1) AHS elective (3) <u>or</u> ENGL 015/030 (GWS) Rhetoric and Composition (3) 15 credits</p> |
| <p>PHYS 213 General Physics: Fluids/Thermal (2) PHYS 214 General Physics: Waves/Quantum (2) MATH 230 Calculus with Vector Analysis (4) Programming (3) <u>or</u> MATH 220 Matrices (2) AHS elective (3) GHA elective (1.5) 15.5/14.5 credits</p> | <p>PHYS 237 Introduction to Modern Physics (3) MATH 251 Ordinary and Partial Diff. Equations (4) CAS 100 (GWS) Effective Speech (3) MATH 220 Matrices (2) <u>or</u> Programming (3) AHS elective (3) 15/16 credits</p> |
| <p>PHYS 400 Intermediate Electricity and Magnetism (4) PHYS 419 Theoretical Mechanics (3) <u>or</u> MATH 4xx (3) E SC 312 Eng. Apps of Waves and Particle Concepts (3) GN elective (3) AHS elective (3) 16 credits</p> | <p>PHYS 410 Introduction to Quantum Mechanics (4) MATH 4xx (3) <u>or</u> PHYS 419 Theoretical Mechanics (3) E SC 313 Introduction to Nanotechnology (3) PHYS 444 (2) AHS Elective (3) 15 credits</p> |
| <p>PHYS 420 Thermal Physics (3) PHYS 412 Solid State Physics I (3) E SC 4xx (3) ENGL 202C (GWS) Effective Writing: Tech. Writing (3) AHS elective (3) 15 credits</p> | <p>PHYS 457W Experimental Physics (3) E SC 4xx (3) Elective (3) Elective (3) GHA elective (1.5) 13.5 credits</p> |

- **Bold** indicates courses for which ‘C or better’ grades are required for graduation.
- AHS elective stands for either GA, GH, or GS (General Arts, Humanities, or Social Sciences)
- Elective stands for any of 6 credits of ‘program list’ electives.
- MATH 4xx (3) can be taken from the following list: MATH 405, 406, 411, 412, 414, 415, 416, 417, 418, 421, 422, 450, 451, 455, 456 or 484.
- Programming means CMPSC 101, 121, 200, 201, or 202.
- E SC 4xx = E SC 419, 481, 482, 483, 484 or other courses allowed for the nanotechnology minor.
- **Total credits: 121 listed here: Includes FYS course (1 cr) if starting at the UP campus.**

Physics Department 'Program List': Students in the General and Medical Physics (Electronics, Computational, and Nanotechnology/Materials) options may select 9 (6) elective credits from the Departmental Program list. Students may select such supporting courses from nearly the entire range of PSU course offerings with the exception of the following courses which may **NOT** be used under 'program list electives'.

- ASTRO 001-199
- BI SC
- BBH 001-299
- CAS 004
- CSD 100, 101
- CHEM 001, 002, 006, 011
- ENGL 004, 005
- KINES 001-140
- LL ED
- MATH 001-200
- PHYS 001, 150, 151, 250, 251

All engineering courses labeled 'Technology', including AE T, BE T, CE T, CMPET, EE T, EMET, EG T, ET, IE T, MFET, MAT T, ME T, MCH T, and SE&T courses, are **NOT** allowed.

Note that many courses in physics (beyond those already required in a specific option) are included in this list, as are credits for CO-OP experiences (SC 295, 395 or 495) – this includes PHYS 496 (Independent Study or Research). For all options, a maximum of 6 credits of SC 295, 395, and 495 **or** PHYS 496 are allowed under program list electives. A maximum of six (6) credits in ROTC courses (ARMY, AIR, NAVSC, etc.) are also allowed in all options, as per Penn State rules.

Note also that one additional 4xx level MATH course is all that is required to obtain a Math minor in the General option. Additional 4xx level MATH courses can be used as 'Program List' electives. Note also that **ALL** courses used for **ANY MINOR** must be 'C or better'.

Advising notes:

- The Physics First Year Seminar (FYS) is listed on the Schedule of Courses web page (<http://schedule.psu.edu>) as PSU 016 (Section 350) and is only offered in Fall semesters.
- The PHYS 444 ('careers') course is only offered in Spring semesters so all juniors should take it in their 6th semester if at all possible.
- Use the 'Past Course Offerings' link from the Schedule of Courses web page (<http://schedule.psu.edu>), to view historical patterns (Fall, Spring, or both semesters) of junior/senior level required courses and electives PHYS and other courses.