

**UNIVERSITY OF PENNSYLVANIA**  
**Nanotechnology Master Program**  
**Course Planning Guide (CPG)**

Name: \_\_\_\_\_

Previous Major(s): \_\_\_\_\_

Submission Date: \_\_\_\_\_

Email: \_\_\_\_\_

**DEGREE REQUIREMENT CHECKLIST** – A total of ten (10) course units (CU) and four (4) seminars must be completed for the degree.

*\*Please refer to the registrar's website ([www.upenn.edu/registrar](http://www.upenn.edu/registrar)) for detailed and current course information including descriptions and schedules.*

**CORE REQUIREMENTS - 2 CU**

Year & Term	Offering Term*		
_____	F	ENGR 504	Fundamental Concepts in Nanotechnology
_____	F	ESE/MSE 525	Nanoscale Science and Technology

**BEHAVIOR, PROPERTIES AND DEVICES - 2 CU**

Year & Term	Offering Term*		
_____	F	BE 583	Molecular Imaging
_____		CBE 525	Molecular Modeling and Simulations
_____		CBE 545	Electrochemical Energy Conversion and Storage
_____	F	CBE 640	Transport Processes I
_____	F	CHEM 521	Statistical Mechanics I
_____	F	EAS 501	Energy and Its Impacts
_____	S	EAS 502	Renewable Energy and Its Impacts
_____	F	EAS 503	Energy Systems & Policy
_____	S	ESE 521	The Physics of Solid State Energy Devices
_____		ESE/MEAM 529	Introduction to MEMS and NEMS
_____	F	MEAM 502	Energy Engineering
_____	F	MEAM 504	Tribology
_____		MEAM 522	Fundamentals of Sensor Technology
_____	S	MEAM 527	Finite Element Analysis
_____	S	MEAM 550	Design of Micro-electromechanical Systems
_____	F	MEAM 570	Transport Processes I
_____		MEAM 572	Micro/Nanoscale Energy Transfer
_____	F	MEAM 575	Micro and Nano Fluidics
_____		MEAM 663	Entropic Forces in Biomechanics
_____	F	MEAM/MSE 505	Mechanical Properties of Macro/Nanoscale Materials
_____	S	MEAM/MSE 537	Nanomechanics and Nanotribology at Interfaces
_____	F	MSE 545	Materials for Energy Storage and Generation
_____		MSE 570	Physics of Materials
_____		MSE 571	Physics of Materials II
_____	F	PHYS 511	Introduction to Quantum Mechanics I
_____	S	PHYS 518	Introduction to Condensed Matter Physics
_____	F	PHYS 564	Laboratory Electronics

**SYNTHESIS, MATERIALS AND NANO FABRICATION - 2 CU**

Year & Term	Offering Term*		
_____	F	CBE 510	Polymer Engineering
_____	S	CBE 511	Physical Chemistry of Polymers and Amphiphiles
_____	S	CBE 535	Interfacial Phenomenon
_____	S	CBE 546	Fundamental Industrial Catalytic Processes
_____	F	CHEM 523	Quantum Chemistry I
_____	F	ESE 574/MEAM 564	The Principles and Practice of Microfabrication Technology
_____	S	MEAM 553/MSE 561	Atomistic Modeling in Materials Science
_____	S	MSE 520	Structure of Materials
_____	S	MSE 565	Fabrication and Characterization of Devices Micro and Nanostructured Devices
_____	F	MSE 580	Polymers and Biomaterials
_____		PHYS 528	Introduction to Liquid Crystals

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**BIOLOGY AND BIOTECHNOLOGY - 2 CU**

Year & Term	Offering Term*		
_____		BE 505	Quantitative Human Physiology
_____	S	BE/CBE 540	Biomolecular and Cellular Engineering
_____		CBE 552	Cellular Engineering
_____	F	BE/CBE 554	Engineering Biotechnology
_____	F	BE/CBE/MEAM 555	Nanoscale Systems Biology
_____	S	BE/CBE/MEAM 562	Drug Discovery and Development
_____	F	BE 650	Advanced Biomedical Imaging Application
_____	S	BIOL/CAMB/MOLB 526	Experimental Principles in Cell and Molecular Biology
_____		CBE 560	Biomolecular Engineering
_____	F	CHEM 451	Biological Chemistry I
_____		CHEM 559	Biomolecular Imaging
_____	F	CHEM/BMB 567	Bio-inorganic Chemistry
_____		PHYS 580/BMB 590	Biological Physics

**TECHNOLOGY MANAGEMENT, COMMERCIALIZATION AND SOCIETAL IMPLICATION - 2 CU**

Year & Term	Offering Term*	For Wharton Courses, visit <a href="http://spike.wharton.upenn.edu/courses/index.cfm">http://spike.wharton.upenn.edu/courses/index.cfm</a>	
_____	S	BE 502	Lab to Marketplace
_____		BEPP/LGST 621 (0.5 cu)	The Governmental and Legal Environment of Business
_____	S	BEPP/OPIM 761	Risk Analysis and Environmental Management
_____	F/S/M	EAS/IPD 545	Engineering Entrepreneurship I
_____	F/S	EAS/IPD 546	Engineering Entrepreneurship II
_____	M	EAS 548	High-Tech Venture Development
_____	F	EAS 591 (0.5 cu)	Leading Technology Teams
_____	F	EAS 595	Foundations of Leadership
_____	F	ESE 540	Engineering Economics
_____	F	ESE 544	Project Management
_____	M/F	IPD 515	Product Design
_____	F	IPD 549	Product Development/Entrepreneurial Ventures
_____	S	LGST 815	Environmental Management Law and Policy
_____	F2	MGMT 731 (0.5 cu)	Technology Strategy Management
_____	S1/S2	MGMT 802 (0.5 cu)	Innovation, Change & Entrepreneurship Management
_____	F1	MGMT 804 (0.5 cu)	Venture Capital and Entrepreneurial Management
_____	S1	MKTG 753 (0.5 cu)	New Product Development
_____	F1	MKTG 755 (0.5 cu)	Advertising Management
_____	F	MKTG 756	Marketing Research
_____		OPIM 631 (0.5 cu)	Operations Management
_____	F	OPIM 651 (0.5 cu)	Innovation, Problem Solving, & Design
_____	F	OPIM 654 (0.5 cu)	Product Design & Development

**FREE ELECTIVE** - Program director required. Petition needs academic reason and course syllabus/description.

Year & Term	Offering Term*		
_____	F/S/M	NANO 597	Master's Thesis Research I
_____	F/S/M	NANO 597	Master's Thesis Research II
_____	F/S/M	NANO 599	Independent Research

**SEMINARS SUMMARY** - Nanotechnology seminars (4 required). Due BEFORE end of classes at the last semester.

Date	Department	Speaker	Title
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____