ENGINEERING PHYSICS

An Interdisciplinary Program Jointly Offered by the
School of Engineering and the
Department of Physics, College of Liberal Arts and Sciences

I. JUSTIFICATION

Technology is a driving force in the world today. An ability to participate in the technological advances not only needs a strong background in engineering fundamentals, but also an understanding of the physical principles of the underlying mechanisms. Among these technologies are silicon microprocessors, communication technologies, micro-electro-mechanical sensors, image processing, and many others.

Examples of physics questions associated with the directions of current technologies are: What is the fundamental size limitation of electronic devices? What are the limitations of quantum computing? What is a spin transistor or what is a single electron transistor? What material systems should be considered in order to produce tera-hertz switching? How are micro-channels used to cool VLSI circuits using fluids? What are nano-structures? To answer these questions and others which relate to technological advancements, a deeper understanding of the underlying physical principles is required.

The goal of the Engineering Physics Program is to offer students a solid background in the fundamentals of physics while applying that knowledge to engineering disciplines. It is intended for students who would seek employment in industry after the baccalaureate degree, plan to attend graduate school in either a specific engineering discipline or in Physics/Applied Physics, or plan to pursue a professional career with advanced degrees in law or business. The program is designed to provide a fundamental understanding of physical principles, a strong background in quantitative skills, and a strong background in an engineering discipline.

II. CATALOG COPY

The Engineering Physics major is a joint program between the School of Engineering and the College of Liberal Arts and Sciences, Department of Physics. The undergraduate Engineering Physics major offers students a strong foundation in physical science and engineering so that a wide range of career choices are available after graduation. The program introduces the student to the key theoretical foundations and application areas in preparation for both industrial careers and graduate study. The major requires 128 credits of course work including senior thesis if any.

The courses prescribed for the program meet the general education requirements of both the School of Engineering and the College of Liberal Arts and Sciences. Administration of the program is the responsibility of co-directors appointed by the Dean of Engineering and the Department Head of Physics. The directors will make recommendations to the Dean and Department Head for modifications, waivers, and substitutions of course requirements by individual students. Students are required to meet the academic level of performance as specified by both schools.

The engineering disciplines included in the following are Electrical Engineering (EE), Metallurgy and Materials Engineering (MMAT), and Mechanical Engineering (ME). Students who are unsure about their preparation or their choice of a major should consult with the appropriate advisors in the School of Engineering and the Department of Physics for help in selecting a program that is most suitable. The exact sequence of humanities and social science courses may be chosen by the student, although the ones shown below are recommended. A suitably prepared student who follows one of the curricula listed below should be able complete the requirements for the Bachelor of Science in Engineering Physics in eight semesters. However, students may also choose to spread their studies over nine or ten semesters.

ENGINEERING PHYSICS (EE)
FRESHMAN YEAR

First Semester	Credits	Second Semester	Credits
MATH 1131Q- Calculus I (115Q)	4	MATH 1132Q-Calculus II (116Q)	4
CHEM 1127Q-Gen. Chem. I (127Q)	4	CHEM 1128Q – General Chemistry II (128Q)	4
PHYS 1501Q -Physics for Engin. I (151Q)	4	PHYS 1502Q -Physics for Engin. II (152Q)	4
ENGL 1010 or ENGL 1011-Acad. Writing (110/111)	4	Arts and Humanities Course[2]	3
ENGR 1000-Orientation to Engr. (100)	1	CSE 1100C – Intro. To Computing (123C)	2
	17		17

SOPHOMORE YEAR

First Semester	Credits	Second Semester	Credits
MATH 2110Q-Multivariable Calc.(210Q)	4	MATH 2410Q-Differential Equations (211Q)	3
PHYS 3101Q – Mechanics I (242Q)	3	ECE 2001W- Electric Circuits (210W)	4
PHYS 2501WC – Lab. in Electricity, Magnetism, & Mechanics (258WC)	3	PHYS 2300Q – Quantum Physics (230Q)	3
CSE 2300W - Logic Design (210W)	4	PHIL 1104 Phil. and Social Ethics (104)	3
		Social Sciences Course[2]	3
	14		16

JUNIOR YEAR

First Semester	Credits	**Second Semester**	Credits
ECE 3201- Elect. Devices & Circuits (212)	4	ECE 3111- Systems Analysis (232)	3
ECE 3101-Signals and Systems (202)	3	PHYS 3202Q – Electricity and Magnetism II (257Q)	3
PHYS 3201Q- Elect. & Magnetism I (255Q)	3	STAT 3345Q – Prob. Mod. For Engr. (224Q)	3
MATH 2210Q-Linear Algebra (227Q)	3	Social Sciences course[2]	3
MATH 3410Q – Diff. Eqns. Appl. (272Q)	3	Diversity and Multiculturalism course[2]	3
	16		15

SENIOR YEAR

First Semester	Credits	Second Semester	Credits
ECE 4901-Comp. & Elec. Engr. Design I (290)	2	ECE 4902-Comp & Elec. Engr. Design II (291)	3
ECE 4111 – Communication Systems (241)	3	ECE 4211-Micro/Optoelectronic Device (245)	3
ECE 3223 – Optical Engineering (223)	3	ECE 3225 – Optical Engineering Lab (225)	3
PHYS 3401Q – Quantum Mech.[3] (261Q)	3	Diversity and Multiculturalism course[2]	3
PHYS 3300Q – Stat. /Therm. Phys. (271Q)	3	Elective	3
Elective	3		
	17		15

The three-semester sequence of MATH 1120Q-1121Q (112Q-113Q) followed by Math 1132Q (116Q) may be taken instead to satisfy this requirement. MATH 1120Q (112Q) cannot be used toward the required 128 credits for the Engineering degree.

[2]The courses from content areas one (Arts and Humanities) and two (Social Sciences) must be from four different departments. One course from either content area one (Arts and Humanities) or content area two (Social Sciences) may also be used to fulfill one of the requirements from content area four (Diversity and Multiculturalism). One course from content area four must be an international course.

[3]Quantum mechanics for Engineers offered by the ECE department can be substituted.

Engineering Physics (ME)

Fall Semester	Credits	Spring Semester	Credits
FRESHMAN YEAR			
PHYS 1501Q - Physics for Engineers I	4	PHYS 1502Q - Physics for Engineers II	4
CHEM 1127Q - General Chemistry I	4	CHEM 1128Q - General Chemistry II	4
MATH 1131Q - Calculus I	4	MATH 1132Q - Calculus II	4
ENGR 1000 - Orientation to Engineering	1	CSE 1100C - Intro. to Computing	2
ENGL 1010 or 1011 – Seminar English Course	4	ENGR 1166 – Foundations of Engr.	3
Total Credits	**17**	**Total Credits**	**17**
SOPHOMORE YEAR			
PHYS 3101 - Mechanics I	3	PHYS 2300 - Quantum Physics	3
PHYS 2501W - Lab.	3	ME 2233 - Thermo. Prin. I	3
MATH 2110Q - Multivar. Calc.	4	MATH 2410Q - Elem. Diff. Eqns.	3
CE 2110 - Applied Mechanics I	3	CE 3110 - Mechanics of Materials	3
PHIL 1104 (CA 1)	3	General Education Course (CA 2)	3
Total Credits	**16**	**Total Credits**	**15**
JUNIOR YEAR			
PHYS 3201 - Electricity & Magnetism I	3	PHYS 3202 - Electricity & Magnetism II	3
MATH 3410 - Diff. Eqns. Appl.	3	STAT 3345Q - Prob. Mod. for Engrs.	3
ME 3250 - Fluid Dynamics I	3	ME 2234 - Applied Thermo.	3
ME 3253 Linear Systems Theory	3	ME 3220 - Dynam. Mech. Sys.	3
General Education Course (CA 1)	3	General Education Course (CA 2)	3
Total Credits	**15**	**Total Credits**	**15**
SENIOR YEAR			
ME 4972 – Senior Design 1	3	ME 4973W – Senior Design 2	3
PHYS 3401- Quantum Mechanics	3	PHYS Elective	3
ME 3242 - Heat Transfer	3	ME Elective	3
ME 3227 - Machine Design	3	ME Elective	3
General Education Course (CA 4)	3	PHYS Elective	3
General Education Course (CA 4)	3		
Total Credits	**18**	**Total Credits**	**15**

Total Credits (Four years) 128

ME Electives:	ME 3214, 3224, 3228, 3229, 3239, 3260, 3262, 3295
Physics Electives:	PHYS 3300, 4210, 4140, 4150

Engineering Physics (MSE)

Fall Semester	Credits	Spring Semester	Credits

FRESHMAN YEAR

Fall Semester	Credits	Spring Semester	Credits
PHYS 1501Q - Physics for Engineers I	4	PHYS 1502Q - Physics for Engineers II	4
CHEM 1127Q - General Chemistry I	4	CHEM 1128Q - General Chemistry II	4
MATH 1131Q - Calculus I	4	MATH 1132Q - Calculus II	4
ENGR 1000 - Orientation to Engineering	1	CSE 1100C - Intro. to Computing	2
ENGL 1010 or 1011 – Seminar English Course	4	ENGR 1166 – Foundations of Engr.	3
Total Credits	**17**	**Total Credits**	**17**

SOPHOMORE YEAR

Fall Semester	Credits	Spring Semester	Credits
PHYS 3101 - Mechanics I	3	PHYS 2300 - Quantum Physics	3
PHYS 2501W - Lab.	3	MATH 2410Q - Elem. Diff. Eqns.	3
MATH 2110Q - Multivar. Calc.	4	MSE 2002 - Intro. to Structure II	3
MSE 2001 - Intro. to Structure I	3	General Education Course CA 1	3
PHIL 1104 – Ethics	3	MSE 2053 - Materials Lab. I	1
		General Education Course CA 2	3
Total Credits	**16**	**Total Credits**	**16**

JUNIOR YEAR

Fall Semester	Credits	Spring Semester	Credits
PHYS 3201 - Electricity & Magnetism I	3	PHYS 3202 - Electricity & Magnetism II	3
MATH 3410Q - Diff. Eqns. Appl.	3	PHYS 4150 - Optics	4
MSE 3003 - Structure/Properties I	3	PHYS 4210 - Intro. to Solid State Phys.	3
MSE 3055 Microstructure Lab	1	MSE 3004 - Structure/Properties II	3
General Education Course CA2	3	MSE 3056 – Mech Behavioral Lab	1
MSE 3001 - Applied Thermodynamics	3	MSE 3002 - Materials Processing	4
Total Credits	**16**	**Total Credits**	**18**

SENIOR YEAR

Fall Semester	Credits	Spring Semester	Credits
MSE 4901 Capstone Design I	2	MSE 4902W Capstone Design II	2
PHYS 3401 - Quantum Mechanics*	3	PHYS Elective	3
MSE 4003W- Materials Characterization	3	CHEG 3156 -Polymeric Materials	3
MSE Elective	3	MSE Elective	3
General Education Course CA4	3	General Education Course CA4	3
Total Credits	**14**	**Total Credits**	**14**

Total Credits (Four years) 128

MSE Electives:	MSE 4004, 4005
Physics Electives:	PHYS 3300, 4140