# CHANGE OF PHYSICS SEQUENCE IN ENGINEERING CURRICULA

Intent – to acknowledge that many of the COE's degree programs have modified the placement of the calculus-based physics sequence in their curricula.

# RATIONALE FOR CHANGE (FOR AY 2014-2015 CATALOG):

- This purpose of this change is to:
  - ease the freshman engineering student's transitional first semester from high school to the University,
  - improve the freshman engineering student's potential for success as they adjust to the demands of the required courses in their engineering curricula.
- Implementation:
  - Begin the required calculus-based physics sequence in the *second* semester freshman year. It currently begins in the *first* semester freshman year. The science and mathematics sequences are as shown below, with the changes to be in place for the 2014-2015 academic year.
    - First Semester
      - From: CHM 101, 102; PHY 203, 273; and MTH 141
      - *To:* CHM 101, 102; and MTH 141
    - Second Semester
      - *From:* PHY 204, 274; and MTH 142
      - *To:* PHY 203, 273; and MTH 142
- Many, but not all, engineering programs across the U.S. have this, or a very similar model.

**Note:** During spring 2013, the BME, CPE, CVE, ELE, ISE, and MCE B.S. degree programs all agreed to adopt this change to their curricula effective with the 2014-2015 academic year, and therefore, it will be common to their degree programs. However, this change has not been adopted by the CHE and OCE programs, and both of these programs have decided to keep their existing freshman year science and mathematics sequence.

# *Curriculum sheets for all College of Engineering majors with the change in the physics sequence highlighted are attached.*

# **BIOMEDICAL ENGINEERING - Class of 2018 DRAFT**

# Freshman Year Fall Semester

Course Code	Description	Cr	
CHM 101	General Chemistry Lec I [GE-N]	3	
CHM 102	General Chemistry I Lab	1	
ECN 201	Principles of Microeconomics [GE-S]	3	
EGR 105	Foundations of Engineering I	1	
MTH 141	Intro Calculus with Analytic Geom [GE-MQ]	4	
	General Education Elective*	3	
		15	

### Sophomore Year Fall Semester

Course Code	Description	Cr	
BIO 121	Human Anatomy	4	
BME 281	Biomedical Engineering Seminar II	1	
ELE 201	Digital Circuits Design	3	
ELE 202	Digital Circuits Design Lab	1	
MTH 362	Advanced Engineering Mathematics I	3	
PHY 204	Elementary Physics II [GE-N]	3	
PHY 274	Elementary Physics Lab II [GE-N]	1	
		16	

# Junior Year Fall Semester

Course Code	Description	Cr	
BIO 341	Principles of Cell Biology	3	
BME 307	Bioelectricity	3	
ELE 313	Linear Systems	3	
ELE 338	Electronics I	3	
ELE 339	Electronics I Lab	1	
	General Education Elective*	3	
		16	

# Senior Year Fall Semester

Course Code	Description	Cr	
BME 461	Physiological Modeling and Control	3	
BME 464	Medical Imaging	3	
BME 465	Medical Image Processing Lab	1	
BME 484	BME Capstone Design I	2	
ELE 400	Intro to Professional Practice	1	
	Technical Elective**	3-4	
		13 -14	

# Freshman Year Spring Semester

Total Credits = 122 -123

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Course Code	Description	Cr	
BME 181	Biomedical Engineering Seminar I	1	
CHM 124	Intro to Organic Chemistry	3	
EGR 106	Foundations of Engineering II	2	
MTH 142	Intermed Calc with Analytic Geom [GE-MQ]	4	
PHY 203	Elementary Physics I [GE-N]	3	
PHY 273	Elementary Physics Lab I [GE-N]	1	
	General Education Elective*	3	
		17	

#### Sophomore Year Spring Semester

Course Code	Description	Cr	
BIO 242	Intro Human Physiology	3	
BIO 244	Intro Human Physiology Lab	1	
BME 207	Intro to Biomedical Engineering	3	
ELE 212	Linear Circuit Theory	3	
ELE 215	Linear Circuits Lab	2	
MTH 243	Calculus for Functions of Several Vars	3	
		15	

#### Junior Year Spring Semester

Course Code	Description	Cr	
BME 360	Biomeasurement	3	
BME 361	Biomeasurement Lab	1	
ELE 314	Linear Systems and Signals	3	
ISE 411 <b>or</b> STA 409	Probability and Statistics for Engineers <b>or</b> Statistical Methods in Research I	3	
	General Education Elective*	3	
	Free Elective	3	
		16	

# Senior Year Spring Semester

Course Code	Description	Cr	
BME 462	Biomedical Instrumentation	3	
BME 468	Neural Engineering	3	
BME 485	BME Capstone Design II	2	
	General Education Elective*	3	
	General Education Elective*	3	
		14	

\* Note the following specific requirements and restrictions for General Education [GE] electives:
-Refer to specific Biomedical Engineering General Education course requirements (see 2018 BME Check Sheet).
-[GE-EC/ECw] Must take at least six (6) credits in General Education [GE-EC/ECw], with at least one (1) course in writing [GE-ECw].
-[GE-ECw] Can only take one (1) of the following 100-level writing courses for General Education credit [GE-ECw]: WRT 104, WRT 105, WRT 106.

\*\* Technical Elective may be chosen from the following: CHE 333, 347, 574; CSC 522; EGR 377; ELE 322, 343/344, 435/436, 437, 438, 444/445, 447/448, 458/459, 501, 506; HPR 323; ISE 404, 412; MCE 341, 354, 372; MTH 442, 451, 462, 471.

# **BIOMEDICAL ENGINEERING - Class of 2018 DRAFT**

# Freshman Year Fall Semester

Course Code	Description	Cr	
CHM 101	General Chemistry Lec I [GE-N]	3	
CHM 102	General Chemistry I Lab	1	
ECN 201	Principles of Microeconomics [GE-S]	3	
EGR 105	Foundations of Engineering I	1	
MTH 141	Intro Calculus with Analytic Geom [GE-MQ]	4	
	General Education Elective*	3	
		15	

### Sophomore Year Fall Semester

Course Code	Description	Cr	
BIO 121	Human Anatomy	4	
BME 281	Biomedical Engineering Seminar II	1	
ELE 201	Digital Circuits Design	3	
ELE 202	Digital Circuits Design Lab	1	
MTH 362	Advanced Engineering Mathematics I	3	
PHY 204	Elementary Physics II [GE-N]	3	
PHY 274	Elementary Physics Lab II [GE-N]	1	
		16	

# Junior Year Fall Semester

Course Code	Description	Cr	
BIO 341	Principles of Cell Biology	3	
BME 307	Bioelectricity	3	
ELE 313	Linear Systems	3	
ELE 338	Electronics I	3	
ELE 339	Electronics I Lab	1	
	General Education Elective*	3	
		16	

# Senior Year Fall Semester

Course Code	Description	Cr	
BME 461	Physiological Modeling and Control	3	
BME 464	Medical Imaging	3	
BME 465	Medical Image Processing Lab	1	
BME 484	BME Capstone Design I	2	
ELE 400	Intro to Professional Practice	1	
	Technical Elective**	3-4	
		13 -14	

# Freshman Year Spring Semester

Total Credits = 122 -123

Course Code	Description	Cr	
BME 181	Biomedical Engineering Seminar I	1	
CHM 124	Intro to Organic Chemistry	3	
EGR 106	Foundations of Engineering II	2	
MTH 142	Intermed Calc with Analytic Geom [GE-MQ]	4	
PHY 203	Elementary Physics I [GE-N]	3	
PHY 273	Elementary Physics Lab I [GE-N]	1	
	General Education Elective*	3	
		17	

#### Sophomore Year Spring Semester

Course Code	Description	Cr	
BIO 242	Intro Human Physiology	3	
BIO 244	Intro Human Physiology Lab	1	
BME 207	Intro to Biomedical Engineering	3	
ELE 212	Linear Circuit Theory	3	
ELE 215	Linear Circuits Lab	2	
MTH 243	Calculus for Functions of Several Vars	3	
		15	

#### Junior Year Spring Semester

Course Code	Description	Cr	
BME 360	Biomeasurement	3	
BME 361	Biomeasurement Lab	1	
ELE 314	Linear Systems and Signals	3	
ISE 411 <b>or</b> STA 409	Probability and Statistics for Engineers <b>or</b> Statistical Methods in Research I	3	
	General Education Elective*	3	
	Free Elective	3	
		16	

# Senior Year Spring Semester

Course Code	Description	Cr	
BME 462	Biomedical Instrumentation	3	
BME 468	Neural Engineering	3	
BME 485	BME Capstone Design II	2	
	General Education Elective*	3	
	General Education Elective*	3	
		14	

\* Note the following specific requirements and restrictions for General Education [GE] electives:
-Refer to specific Biomedical Engineering General Education course requirements (see 2018 BME Check Sheet).
-[GE-EC/ECw] Must take at least six (6) credits in General Education [GE-EC/ECw], with at least one (1) course in writing [GE-ECw].
-[GE-ECw] Can only take one (1) of the following 100-level writing courses for General Education credit [GE-ECw]: WRT 104, WRT 105, WRT 106.

\*\* Technical Elective may be chosen from the following: CHE 333, 347, 574; CSC 522; EGR 377; ELE 322, 343/344, 435/436, 437, 438, 444/445, 447/448, 458/459, 501, 506; HPR 323; ISE 404, 412; MCE 341, 354, 372; MTH 442, 451, 462, 471.

# **CIVIL ENGINEERING - Class of 2018 DRAFT**

#### Freshman Year Fall Semester

Course Code	Description	Cr	
CHM 101	General Chemistry I Lec [GE-N]	3	
CHM 102	General Chem I Lab	1	
EGR 105	Foundations of Engineering I	1	
MTH 141	Intro Calculus w/Analytic Geom [GE-MQ]	4	
ECN 201	Principles of Microeconomics [GE-S]	3	
	General Education Elective*	3	
		15	

#### Sophomore Year Fall Semester

Course Code	Description	Cr	
CVE 205	Intro to Civil Engineering Tools	2	
GEO 103	Understanding the Earth [GE-N]	4	
MCE 262	Statics	3	
MTH 243	Calculus for Functions of Several Vars	3	
PHY 204	Elementary Physics II Lecture	3	
PHY 274	Elementary Physics II Lab	1	
		16	

#### Junior Year Fall Semester

Course Code	Description	Cr	
CVE 346	Transportation Engineering	3	
CVE 354	Structural Analysis	3	
CVE 355	Structural Analysis Lab	1	
CVE 374	Environmental Engineering	3	
CVE 381	Geotechnical Engineering	3	
CVE 382	Geotechnical Engineering Lab	1	
MCE 354	Fluid Mechanics	3	
		17	

#### Senior Year Fall Semester

Course Code	Description	Cr		
CVE 400	Civil Engineering Licensure	1		
CVE 465	Analysis & Design of Concrete Structures	3		
CVE 497	Civil Engineering Design I	2		
ELE 220	Passive and Active Circuits	3		
WRT 333	Scientific and Technical Writing [GE-ECw]	3		
	Professional Elective**	3		
		15		

Freshman	Voar	Spring	Somostor
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Course Code	Description	Cr	
EGR 106	Foundations of Engineering II	2	
MTH 142	Intermed Calc with Analytic Geom [GE-MQ]	4	
PHY 203	Elementary Physics I Lect [GE-N]	3	
PHY 273	Elementary Physics I Lab [GE-N]	1	
	General Education Elective*	3	
	General Education Elective*	3	
		16	

#### Sophomore Year Spring Semester

Course Code	Description	Cr	
CHM 112	General Chemistry II Lecture [GE-N]	3	
CVE 220	Mechanics of Materials	3	
CVE 230	Mechanics of Materials Lab	1	
MCE 263	Dynamics	3	
MTH 244	Differential Equations	3	
	General Education Elective*	3	
		16	

# Junior Year Spring Semester

Course Code	Description	Cr	
CVE 347	Highway Engineering	3	
CVE 348	Highway Engineering Lab	1	
CVE 370	Hydraulic Engineering	3	
CVE 375	Hydraulic Engineering Lab	1	
MCE 341	Fundamentals of Thermodynamics	3	
STA 409	Statistics	3	
		14	

# Senior Year Spring Semester

Course Code	Description	Cr	
CVE 483	Foundation Engineering	3	
CVE 498	Civil Engineering Design II	3	
ISE 404	Engrg Economy and Project Planning	3	
	Professional Elective**	3	
	Professional Elective**	3	
	Take FE Exam		
		15	

\* Note the following specific requirements and restrictions for General Education [GE] electives:
 -Refer to specific Civil Engineering General Education course requirements (see 2018 CVE Check Sheet).
 -Must take WRT 333 [GE-ECw] and additional three (3) credits of General Education [GE-EC/ECw].

\*\* *Three* of the *nine (9)* credits *must* be one of the following courses: CVE 470, 471, 475, 478. The *remaining six (6)* credits are to be selected from the list in the Civil Engineering Undergraduate Student Handbook.

# Total Credits = 124

# **ELECTRICAL ENGINEERING - Class of 2018 DRAFT**

#### Freshman Year Fall Semester

Course Code	Description	Cr	
CHM 101	General Chemistry I Lec [GE-N]	3	
CHM 102	General Chemistry I Lab	1	
ECN 201	Principles of Microeconomics [GE-S]	3	
EGR 105	Foundations of Engineering I	1	
MTH 141	Intro Calculus w/Analytic Geom [GE-MQ]	4	
	General Education Elective*	3	
		15	

#### Sophomore Year Fall Semester

Course Code	Description	Cr	
ELE 201	Digital Circuit Design	3	
ELE 202	Digital Circuit Design Lab	1	
MTH 362	Advanced Engineering Mathematics I	3	
PHY 204	Elementary Physics II Lec [GE-N]	3	
PHY 274	Elementary Physics II Lab [GE-N]	1	
	General Education Elective*	3	
	General Education Elective*	3	
		17	

# Junior Year Fall Semester

Course Code	Description	Cr	
ELE 313	Linear Systems	3	
ELE 331	Intro to Solid State Devices	4	
ELE 338	Electronics I	3	
ELE 339	Electronics I Lab	1	
MTH 451 <b>or</b> ISE 411	Intro to Probability and Statistics <b>or</b> Probability and Statistics for Engineers	3	
		14	

#### Senior Year Fall Semester

Course Code	Description	Cr	
ELE 400	Intro to Professional Practice	1	
ELE 480	Capstone Design I	3	
	Electrical Engineering Design Elective**	4	
	Electrical Engineering Design Elective**	3-4	
	Professional Elective**	3-4	
		14 -16	

#### Freshman Year Spring Semester

Total Credits = 120 -123

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Course Code	Description	Cr	
CSC 200	Computer Problem Solving	4	
EGR 106	Foundations of Engineering II	2	
ELE 101	Intro to Electrical Engineering	1	
MTH 142	Intermed Calc with Analytic Geom [GE-MQ]	4	
PHY 203	Elementary Physics I Lect [GE-N]	3	
PHY 273	Elementary Physics I Lab [GE-N]	1	
		15	

# Sophomore Year Spring Semester

Course Code	Description	Cr	
ELE 205	Microprocessors	2	
ELE 206	Microprocessor Lab	1	
ELE 212	Linear Circuit Theory	3	
ELE 215	Linear Circuits Lab	2	
MTH 243	Calculus for Functions of Several Vars	3	
PHY 205	Elementary Physics III Lec [GE-N]	3	
PHY 275	Elementary Physics III Lab [GE-N]	1	
		15	

#### Junior Year Spring Semester

Course Code	Description	Cr	
ELE 301	Electronic Design Automation	3	
ELE 302	Electronic Design Automation Lab	1	
ELE 314	Linear Systems and Signals	3	
ELE 322	Electromagnetic Fields I	4	
ELE 343	Electronics II	3	
ELE 344	Electronics II Lab	1	
		15	

#### Senior Year Spring Semester

Course Code	Description	Cr	
ELE 481	Capstone Design II	3	
	Electrical Engineering Design Elective**	3-4	
	General Education Elective*	3	
	General Education Elective*	3	
	Free Elective	3	
		15 -16	

\* Note the following specific requirements and restrictions for General Education [GE] electives:
-Refer to specific Electrical Engineering General Education course requirements (see 2018 ELE Check Sheet).
-[GE-EC/ECw] Must take at least six (6) credits of General Education [GE-EC/Ecw], with at least one (1) course in writing, [GE-ECw].
-[GE-ECw] Can only take one (1) of the following 100-level writing courses for General Education credit [GE-ECw]: WRT 104, WRT 105, WRT 106.

\*\* Electrical Engineering Design Electives are chosen as follows: *three (3)* courses from ELE 401/402, 423, 427/428, 432, 435/436, 444/445, 447/448, 457, or 458/459. At least *one (1)* course must include a lab component. Furthermore, *one (1)* course must be from ELE 401/402, 423, 432, 444/445, or 447/448.

\*\*\* Professional Elective is chosen as follows: *one (1)* course from: BME 462; BME/ELE 461; ELE 405/406, 408/409, 437, 438, 470, *or one (1)* additional Electrical Engineering Design Elective; MTH 215; or, by prior approval of the ECBE department Chair, any junior or senior level College of Engineering

# **INDUSTRIAL AND SYSTEMS ENGINEERING - Class of 2018 DRAFT**

# Total Credits =

122

Course Code	Description	Cr	
CHM 101	General Chemistry I Lec [GE-N]	3	
CHM 102	General Chemistry I Lab	1	
EGR 105	Foundations of Engineering I	1	
MTH 141	Intro Calculus w/Analytic Geom [GE-MQ]	4	
	General Education Elective*	3	
	General Education Elective*	3	
		15	

# Freshman Year Fall Semester

#### Sophomore Year Fall Semester

Course Code	Description	Cr	
ISE 240	Mfg Processes and Systems	3	
ISE 241	Mfg Processes and Systems Laboratory	1	
MCE 201	Engineering Graphics	3	
MCE 262	Statics	3	
MTH 243	Calculus for Functions of Several Vars	3	
PHY 204	Elementary Physics II Lec [GE-N]	3	
PHY 274	Elementary Physics II Lab [GE-N]	1	
		17	

# Junior Year Fall Semester

Course Code	Description	Cr	
CHE 333	Engineering Materials	3	
EGR 316 <b>or</b> PHL 212	Engineering Ethics or Ethics [GE-L]	3	
ISE 325	Computer Tools for Engineers	3	
ISE 411	Probability and Statistics for Engineers	3	
ISE 432	Deterministic Systems	3	
		15	

# Senior Year Fall Semester

Course Code	Description	Cr	
ISE 401	ISE Capstone Design I	3	
ISE 451	Production System Design	3	
	Professional Elective***	3	
	Professional Elective***	3	
	Free Elective	3	
		15	

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Course Code	Description	Cr	
ECN 201	Principles of Microeconomics [GE-S]	3	
EGR 106	Foundations of Engineering II	2	
MTH 142	Intermed Calc with Analytic Geom [GE-MQ]	4	
PHY 203	Elementary Physics I Lect [GE-N]	3	
PHY 273	Elementary Physics I Lab [GE-N]	1	
	General Education Elective*	3	
		16	

# Sophomore Year Spring Semester

Course Code	Description	Cr	
CVE 220	Mechanics of Materials	3	
ISE 220	Indust and Systems Engrg Seminar**	1	
MCE 263	Dynamics	3	
MTH 362 <b>or</b> MTH 244	Advanced Engineering Mathematics I <b>or</b> Differential Equations	3	
PHY 205	Elementary Physics III Lec [GE-N]	3	
PHY 275	Elementary Physics III Lab [GE-N]	1	
		14	

# Junior Year Spring Semester

Course Code	Description	Cr	
BUS 201	Financial Accounting	3	
ELE 220	Passive and Active Circuits	3	
ISE 404	Engineering Economy and Proj Planning	3	
ISE 412	Statistical Methods and Quality Systems	3	
ISE 433	Stochastic Systems	3	
		15	

#### Senior Year Spring Semester

Course Code	Description	Cr	
ISE 402	ISE Capstone Design II	3	
	Professional Elective***	3	
	Professional Elective***	3	
	Professional Elective***	3	
	General Education Elective*	3	
		15	

\* Note the following *specific* requirements and restrictions for General Education [GE] electives:

-Refer to specific Industrial and Systems Engineering General Education course requirements (see 2018 ISE Check Sheet).

-[GE-ECw] Must take at least one (1) General Education course in writing [GE-ECw].

-[GE-ECw] Can only take *one (1)* of the following **100-level** writing courses for General Education credit [GE-ECw]: WRT 104, WRT 105, WRT 106. -Recommend ECN 202 [GE-S] as a General Education Elective choice.

\*\* Can be taken in either Freshman, Sophomore, or Junior year.

\*\*\* Refer to department approved course list.

# **MECHANICAL ENGINEERING - Class of 2018 DRAFT**

Total Credits =

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Course Code	Description	Cr	
ECN 201	Principles of Microeconomics [GE-S]	3	
EGR 106	Foundations of Engineering II	2	
MTH 142	Intermed Calc with Analytic Geom [GE-MQ]	4	
PHY 203	Elementary Physics I Lect [GE-N]	3	
PHY 273	Elementary Physics I Lab [GE-N]	1	
	General Education Elective*	3	
		16	

# Sophomore Year Spring Semester

Course Code	Description	Cr	
CVE 220	Mechanics of Materials	3	
ISE 220	Indust and Systems Engrg Seminar**	1	
MCE 263	Dynamics	3	
MTH 362 <i>or</i> MTH 244	Advanced Engineering Mathematics I <i>or</i> Differential Equations	3	
PHY 205	Elementary Physics III Lec [GE-N]	3	
PHY 275	Elementary Physics III Lab [GE-N]	1	
		14	

# Junior Year Spring Semester

Course Code	Description	Cr	
ELE 220	Passive and Active Circuits	3	
MCE 302	Design of Machinery	3	
MCE 313	Intro to MCE Experimentation	3	
MCE 348	Heat and Mass Transfer	3	
MCE 366	System Dynamics	3	
		15	

# Senior Year Spring Semester

Course Code	Description	Cr	
MCE 402	Mechanical Engrg Capstone Design II	3	
	Professional Elective**	3	
	Professional Elective**	3	
	General Education Elective*	3	
	Free Elective	3	
		15	

\* Note the following *specific* requirements and restrictions for General Education [GE] electives: -Refer to specific Mechanical Engineering General Education course requirements (see 2018 MCE Check Sheet). -[GE-ECw] Must take at least one (1) General Education course in writing [GE-ECw]. -[GE-ECw] Can only take one (1) of the following 100-level writing courses for General Education credit [GE-ECw]: WRT 104, WRT 105, WRT 106.

\*\* Professional Electives must include three (3) three (3)-credit courses in MCE (no more than two (2) courses from the MCE47\*/CHE47\* series), two (2) of which must be taken at URI; the fourth course may be a 300-500 level course offered by the College of Engineering, CHM, CSC, PHY, or one 400-500 level MTH course.

#### Freshman Year Fall Semester

Course Code	Description	Cr	
CHM 101	General Chemistry I Lec [GE-N]	3	
CHM 102	General Chemistry I Lab	1	
EGR 105	Foundations of Engineering I	1	
MTH 141	Intro Calculus w/Analytic Geom [GE-MQ]	4	
	General Education Elective*	3	
	General Education Elective*	3	
		15	

#### Sophomore Year Fall Semester

Course Code	Description	Cr	
ISE 240	Mfg Processes and Systems	3	
ISE 241	Mfg Processes and Systems Laboratory	1	
MCE 201	Engineering Graphics	3	
MCE 262	Statics	3	
MTH 243	Calculus for Functions of Several Vars	3	
PHY 204	Elementary Physics II Lec [GE-N]	3	
PHY 274	Elementary Physics II Lab [GE-N]	1	
		17	

#### Junior Year Fall Semester

Course Code	Description	Cr	
CHE 333	Engineering Materials	3	
MCE 301	Application of Mechanics in Design	3	
MCE 341	Fundamentals of Thermodynamics	3	
MCE 354	Fluid Mechanics	3	
MCE 372	Engineering Analysis I	3	
		15	

# Senior Year Fall Semester

Course Code	Description	Cr	
MCE 401	Mechanical Engrg Capstone Design I	3	
MCE 414	Mechanical Engineering Experimentation	3	
	Professional Elective**	3	
	Professional Elective**	3	
	General Education Elective*	3	
		15	

# Freshman Year Spring Semester

122