

2019 CHECKLIST: Biological Systems Engineering: Bioprocess

Student _____
 Student ID _____
 Telephone No. _____
 Expected Graduation Month and Year _____

University General Education Requirements

Each course taken to meet a university general education requirement can be used to meet a CALS B.S. requirement and/or a requirement of the major.

Crds	Sem/Yr Taken	Grd	Requirement	Course Taken to Meet Requirement
_____	_____	_____	Communication Part A Course (3 credits) Any course with a <i>Comm-A</i> designation in the on-line Guide.	_____
_____	_____	_____	Communication Part B Course (2-3 credits) Any course with a <i>Comm-B</i> designation in the on-line Guide. EPD 397 will also count as a tech elective.	_____
_____	_____	_____	Ethnic Studies Course (minimum of 3 credits) Any course with an <i>Ethnic Studies</i> designation in the on-line Guide.	_____
_____	_____	_____	Humanities Courses (minimum of 6 credits). Courses with a <i>Humanities</i> or <i>Literature</i> breadth designation in the on-line Guide.	_____
_____	_____	_____	Social Science Course (minimum of 3 credits) Any course with a <i>Social Science</i> breadth designation in the on-line Guide.	_____

CALS Bachelor of Science Degree Requirements

Each course taken to meet a CALS B.S. requirement can be used to meet a university general education requirement and/or a requirement of the major.

Crds	Sem/Yr Taken	Grd	Requirement	Course Taken to Meet Requirement
_____	_____	_____	International Studies Course (minimum of 3 credits). For a list of eligible courses see the Guide.	_____
_____	_____	_____	First-Year Seminar Course (1 credit minimum). BSE 170 preferred. For a list of eligible courses see the Guide. Waived for students who transfer into CALS after freshman year.	_____

BSE Major Requirements Common to All Option Areas (Bioprocess)

Crds	Sem/Yr Taken	Grd	Requirement	Course Taken to Meet Requirement
			MATH 221 (5) Calculus and Analytic Geometry	
			MATH 222 (4) Calculus and Analytic Geometry	
			MATH 234 (3) Calculus - Functions of Several Variables	
			MATH 320 (3) [recommended] Linear Algebra and Differential Equations (<i>pre-req</i> : MATH 222) or MATH 319 (3) Techniques in Ordinary Differential Equations (<i>pre-req</i> : MATH 222)	
			STAT 324 (3) Introductory Applied Statistics for Engineers (<i>pre-req</i> : MATH 221)	
			CHEM 109 (5) Advanced General Chemistry or CHEM 103 (4) General Chemistry and CHEM 104 (5) General Chemistry	
			COMP SCI 310 (3,S) (preferred) Problem Solving Using Computers (<i>pre-req</i> : Math 222) or CBE 255 (3) or CIV ENGR 291 (3)	
			Biological Science Course: Food and Bioprocess Engineers need to take MICROBIO 101(3) or 303(3). Any other Biological breadth course credits taken above 3 may be counted as Category D Technical Electives,	
			E M A 201 (3) Statics (<i>pre-req</i> : MATH 222)	
			PHYSICS 202 (5) General Physics (<i>pre-req</i> : MATH 211 or 221)	
			BSE 270 (3,F+Su) Intro to Computer Aided Design	
			Engineering Econ Course: I SY E 313 (3) (preferred) or M E 314 (3) or ACCT I S 300 (3) or FINANCE 300 (3) or GEN BUS 310 (3)	
			BSE 249 (3,F) Engr. Principles for Biological Systems (<i>pre-req</i> : MATH 221), or CBE 250 (3) Process Synthesis (<i>pre-reqs</i> : Chem 329 or con reg). Note that CBE 250 is a prerequisite for CBE 310 and CBE 320 and must be taken by students who plan on enrolling in CBE 310 and CBE 320.	
			BSE 349 (3,S) Biological Concepts for Engineers (<i>pre-reqs</i> : MATH 222, CHEM 104 or 109, introductory biology course)	
			BSE 365 (3,S) Measurements and Instrumentation for Biological Systems (<i>pre-reqs</i> : STAT 324 & PHYSICS 202, full admission status)	
			BSE 308 (1,S) Career Management for Engineers	
			BSE 508 (2,S) Biological Systems Engineering Design Practicum I (<i>pre-req</i> : full admission status)	
			BSE 509 (3,F) Biological Systems Engineering Design Practicum II (<i>pre-reqs</i> : BSE 508, full admission status)	

BSE Major Requirements for F & BE Specialization - Bioprocess Engineering Track

Take BSE 249 and the M E 361, M E 363 and M E 364 sequence, or take CBE 250 and the CBE 310, CBE 320 and CBE 326 sequence.

Crds	Sem/Yr Taken	Grd	Requirement	Course Taken to Meet Requirement
			CHEM 343 (3) [preferred] or CHEM 341 (3) Introductory Organic Chemistry (<i>pre-reqs</i> : CHEM 104 or 109)	
			M E 361 (3) Thermodynamics (<i>pre-reqs</i> : E M A 202, MATH 234), or CBE 310 (3) Chemical Process Thermodynamics (<i>pre-reqs</i> : MATH 234, PHYSICS 201 or equiv; CBE 255 or equiv, CBE 250)	
			M E 363 (3) Fluid Dynamics (<i>pre-reqs</i> : M E 361), or CBE 320 (4) Introductory Transport Phenomena (<i>pre-reqs</i> : Physics 201, Math 319 or 320, CBE 250)	
			MICROBIO 102 (2) General Microbiology Laboratory (<i>pre-reqs</i> : MICROBIO 101 or con), or MICROBIO 304 (2) Biology of Microorganisms Lab (<i>pre-reqs</i> : MICROBIO 303 or con reg)	
			BIOCHEM 501 (3) Introduction to Biochemistry (<i>pre-req</i> : CHEM 341 or 343)	
			BSE 364 (3,S) Engineering Properties of Food and Biological Materials (<i>pre-reqs</i> : Stat 324 & Physics 202)	
			BSE 367 (3,S+F+Su) Renewable Energy Systems	
			BSE 460 (3,F) Biorefining: Energy and Products from Renewable Resources (<i>pre-reqs</i> : CHEM 109 or 104; organic chem or equiv)	
			BSE 461 (3,F) Food & Bioprocessing Operations (<i>pre-reqs</i> : (BSE 249 or CBE 250) and (CIV ENGR 310 or CBE 320 or M E 363), full admission status)	
			BSE 464 (3,S) Heat and Mass Transfer in Biological Systems (<i>pre-reqs</i> : M E 361, CBE 310 or an equivalent thermo course; M E 363, CBE 320, CEE 310 or an equivalent fluids course)	
			BSE Breadth Course. One course from the following: 372 (2,F), 472 (3,S), 473 (2,F), 475 (3,F), 476 (3,S), 571 (3,S)	
			Category A Technical Electives. Introduction to Engineering Course: BSE 170 (2), INTEREGR 170 (2)	
			Category B Technical Electives. Independent Study/Instruction Courses: CALS or CoE courses with a 001, 299, 399, or 699 course number. No more than 3 credits of coursework allowed in this category.	
			Category C Technical Electives. Upper-Level Engineering and Science Courses: Upper-level engineering courses includes engineering courses with a 300 or greater course number, any BSE courses not taken to meet other curricular requirements, and E M A 202 (or M E 240) when not taken to meet another curricular requirement. Upper-level science courses includes all advanced level courses with a biological, natural and/or physical science breadth designation plus CHEM 341, 342, 343, 344, 345, 421 and AGRONOMY/ASM OCN/SOIL SCI 532. Independent study/instruction courses (BSE or otherwise) cannot be included in this category.	
			Category D Technical Electives. Lower-Level Science and Engineering Courses, Breadth Courses: Elementary and intermediate biological, natural and physical science courses except elementary and intermediate math courses; CoE courses with a 100 or 200 level designation; CALS courses, Institute of Environmental Studies courses, and/or School of Business courses. Independent study/instruction courses cannot be counted in this category. No more than 12 credits of coursework allowed in this category.	
			TOTAL credits in bioprocess engineering specialization area must be no less than 43	

Four Year Road Map - Food and Bioprocess Engineering Specialization - Bioprocess Engineering Track

Yr	Sem.	Course	X	Crds	Sem. Total
1	Fall	MATH 221 <i>Calculus and Analytic Geometry</i>		5	16
		CHEM 109 <i>Advanced General Chemistry*</i>		5	
		Ethnic Studies/International Studies/ Humanities/Social Science		3	
		LSC 100 <i>Science and Storytelling</i> or other Comm A course		3	
1	Spring	MATH 222 <i>Calculus and Analytic Geometry</i>		4	14
		COMP SCI 310 <i>Problem Solving Using Computers</i>		3	
		BSE 170 <i>Product Design Practicum</i>		2	
		MICROBIO 101 <i>Biology of Microorganisms</i>		3	
		MICROBIO 102 <i>General Microbiology Laboratory</i>		2	
2	Fall	MATH 234 <i>Calculus - Functions of Several Variables</i>		4	15
		BSE 249 <i>Engr. Princ. Bio Systems / CBE 250 Process Synthesis</i>		3	
		E M A 201 <i>Statics</i>		3	
		BSE 270 <i>Introduction to Computer Aided Design</i>		2	
		CHEM 343 <i>Introductory Organic Chemistry</i>		3	
2	Spring	BSE 349 <i>Biological Concepts for Engineers</i>		3	15
		PHYSICS 202 <i>General Physics</i>		5	
		BSE 308 <i>Career Management for Engineers</i>		1	
		MATH 320 <i>Linear Algebra and Differential Equations</i>		3	
		E P D 397 <i>Technical Comm.</i> or other Comm B course		3	
3	Fall	M E 361 <i>Thermodynamics / CBE 310 Chemical Process Thermo</i>		3	15
		STAT 324 <i>Introductory Applied Statistics for Engineers</i>		3	
		BSE 367 <i>Renewable Energy Systems</i>		3	
		Ethnic Studies/International Studies/ Humanities/Social Science		3	
		BIOCHEM 501 <i>Introduction to Biochemistry</i>		3	
3	Spring	M E 363 <i>Fluid Mechanics / CBE 320 Transport Phenomena</i>		3-4	17-18
		BSE 364 <i>Engr. Properties of Food and Biological Materials</i>		3	
		BSE 365 <i>Measurements and Instrumentation for Bio Systems</i>		3	
		Technical Electives		3	
		BSE 508 <i>Biological Systems Engineering Design Practicum I</i>		2	
		Humanities/Social Science/Ethnic Studies/International Studies		3	
4	Fall	BSE 509 <i>Biological Systems Engineering Design Practicum II</i>		3	17-18
		I SY E 313 <i>Engineering Economic Analysis</i>		3	
		BSE 461 <i>Food and Bioprocessing Operations</i>		3	
		BSE 460 <i>Biorefining</i>		3	
		Technical electives		2-3	
		Humanities/Social Science/Ethnic Studies/International Studies		3	
4	Spring	BSE 464 <i>Heat and Mass Transfer in Biological Systems</i>		3	14
		Free Electives		2	
		Humanities/Social Science/Ethnic Studies/International Studies		6	
		BSE Breadth Requirement Course		3	
Total					125

Notes: Need 125 credits to complete degree. If Chemistry 103 & 104 is taken in place of Chemistry 109, it is suggested to take Chemistry 103 in Fall semester and Chemistry 104 in Spring semester of year 1, and move Microbio 101/102 to the first semester of year 2