Mississippi State University 11/2011

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
Department	Agricultural and Biological Engineering										Biochemistry & Molecular Biology										
Course #	ABE 3303	ABE 3413	ABE 3813	ABE 4323	ABE 4523	ABE 4613	ABE 4624	ABE 4723	ABE 4803	ABE 4813	BCH 4414	BCH 4503	BCH 4603	BCH 4613	BCH 4713	BCH 4804	BIO 1134	BIO 1144	BIO 2103	BIO 3104	BIO 3304
Course Name	Transport in Biological Engineering	Bioinstrumentation I	Biophysical Properties of Materials	Physiological Systems in Biomedical Engineering	Biomedical Materials	Biomechanics	Experimental Methods in Materials Research	Tissue Engineering and Regeneration	Biosystems Simulation	Principles of Engineering Design	Protein Methods	Scientific Communication Skills	General Biochemistry I	General Biochemistry II	Molecular Biology	Molecular Biology Methods	Biology I	Biology II	Cell Biology	Ecology	General Microbiology
Pre-requisite(s), if any	PH 2233, CSE 1213 or CSE 1233	PH 2223	PH 2213	BIO 1504 or equivalent; EM 3313 or equivalent; ABE 3813; ABE 4803 or equivalent	ABE 3813 or CHE 3413 or ME 3403	EM 2413 EM 2433	CHE 3413 or ABE 3813 or ME 3403	ABE 3813	none	senior standing in engineering	BCH 4603	co-registration BCH 4414	CH 4523 or consent of instructor	BCH 4603	BCH 4613	BCH 4613	ACT subscore of 22	BIO 1134	BIO 1134, BIO 1144, CH 1213, CH 1223	BIO 1134, BIO 1144	CH 1053 or CH 1223
Major?	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Yes	Yes	Yes	No	Yes
Offered to Non-major?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Yes	Yes	Yes	Yes	Yes
E1- Apply quantitative reasoning/mathematics to phenomena in the natural world																					
				X													X	X		X	X
									X		X	X				X	X			X	
							X				X						X			X	
									X		X	X			X						
									X							X	X			X	X
					X						X					X	X	X		X	
									X							X	X	X		X	
E2- Scientific inquiry, how scientific knowledge is discovered/validated.											X	E2				X			E2		
											X					X	X	X	X	X	
			X	X							X					X	X	X	X	X	
		X					X				X					X	X	X			X
										X	X	X				X				X	
					X						X	X				X				X	
E3- Basic physical principles, application to living systems.											E3						E3				
						X											X	X			
																		X			
											X							X			
	X										X						X	X			
											X										
				X													X	X			
E4- Basic principles of chemistry, application to living systems.																	E4				
																	X				
																	X	X			V:X
											X		X	X	X	X	X	X			X
																	X	X			X
																	X				X
E5- Biomolecules contribution to structure/function of cells.											X		X	X	X	X	X	E5			
											X		X	X	X	X	X	X	X		X
											X		X	X	X	X	X	X	X		X
											X		X	X	X	X	X		X	X	
											X		X	X	X	X	X				
E6- Molecular/cell assemblies, organs & organisms develop structure/function.											E6		X	X	X		E6				
													X	X	X		X		X		X
							X						X	X	X		X	X			X
													X	X	X		X	X			
						X							X	X	X			X		X	
	X			X							**E7- Organisms sense/control internal environment & respond to external change.**		X					X			
	X			X									X				X	X		X	X
	X			X									X				X	X		X	
	X			X									X					X			
E8- Evolution by natural selection, diversity of life											E8				X		X	X		X	E8
															X		X	X		X	X
															X		X	X		X	

#	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
2				**Biology**																	
3	BIO 3504	BIO 4113	BIO 4114	BIO 4133	BIO 4405	BIO 4413	BIO 4433	BIO 4443	BIO 4442	BIO 4463	BIO 4503	BIO 4514	CH 1211	CH 1213	CH 1221	CH 1223	CH 1234	CH 1244	CH 2141	CH 2311	CH 2313
4	Comparative Anatomy	Evolution	Cellular Physiology	Human Genetics	Pathogenic Microbiology	Immunology	Virology	Bacterial Genetics	Bacterial Genetics Lab	Bacterial Physiology	Vertebrate Histology	Animal Physiology	Investigations in Chemistry I (Lab)	Chemistry I	Investigations in Chemistry II	Chemistry II	Integrated Chemistry I	Integrated Chemistry II	Professional Chemistry: Tools	Analytical Chemistry I Lab	Analytical Chemistry I
5	BIO 1134	MA 1313 or equivalent, BIO 1134 & BIO 1144, BIO 3103 or BIO 4133	7 hrs BIO & 2 semesters of organic chemistry	BIO 1134, BIO 1144 or BIO 2113 or consent of instructor	BIO 3304		BIO 3304, CH 4513	BCH 4603, BIO 3103, BIO 3304	BCH 4603, BIO 3304 and concurrent enrollment in BIO 4443	BIO 3404 and BCH 4603	BIO 1134 & BIO 1144	10 hrs BIO & 10 hrs CH	CH 1213 concurrent	ACT subscore 24 or MA 1313	CH 1223 concurrent	CH 1213	ACT subscore 24 or MA 1313	CH 1234 or CH 1213, CH 1211	CH 1141	CH 1223, CH 1221	CH 1221, CH 1223
6	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Y	Y	Y	Y	Y	Y	Y	Y	Y
7	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Y	Y	Y	Y	N	N	N	Y	Y
8		X			**E1- Apply quantitative reasoning/mathematics to phenomena in the natural world**							X	**E1- Apply quantitative reasoning/mathematics to phenomena in the natural world**						**E1- Apply quantitative reasoning/mathematics to ph**		
9		X	X	X	X	X	X	X	X	X		X		X		X	X	X			X
10		X	X		X	X	X	X	X	X		X			X					X	X
11		X	X	X					X			X								X	X
12		X		X	X					X		X			X			X			X
13		X		X	X			X		X		X			X			X			
14		X	X	X	X		X	X	X	X		X			X					X	
15		X	X		X		X	X	X												
16	scovered/validated.	X			X		**E2- Scientific inquiry, how scientific knowledge is d**		X			X	X		X	**E2- Scientific inquiry, how scientific knowledge is discovered/validate**				X	
17		X			X		X		X			X	X		X					X	
18					X		X		X			X	X		X					X	
19					X		X		X			X	X		X					X	
20			X		X	X			X			X	X		X					X	
21			X		X		X		X	X		X	X		X					X	
22					**E3- Basic physical principles, application to living systems.**								**E3- Basic physical principles, application to living systems.**						**E3- Basic physical principles, application to living s**		
23	X				X		X		X	X		X									
24												X									
25															X		X				
26	X									X		X			X	X	X	X			
27															X		X				
28			X		X					X		X									
29					**E4- Basic principles of chemistry, application to living systems.**								**E4- Basic principles of chemistry, application to living systems.**		X						
30				X										X	X		X				
31			X		X	X				X		X	X	X			X				
32	X		X		X	X		X		X	X	X	X	X			X				
33			X							X		X			X	X		X		X	X
34												X			X	X		X			
35					X			X													
36			X		**E5- Biomolecules contribution to structure/function of cells.**		X	X	X			X	**E5- Biomolecules contribution to structure/function of cells.**								
37		X	X		X	X	X	X	X	X		X									
38			X		X		X	X	X	X		X									
39		X	X	X	X	X	X	X	X			X									
40		X	X	X			X	X	X			X									
41					**E6- Molecular/cell assemblies, org**		X					X	**E6- Molecular/cell assemblies, organs & organisms develop structure/function.**								
42			X		X	X	X	X	X	X	X	X									
43							X				X	X									
44	X	X	X	X			X				X	X									
45	X		X				X					X									
46	X						X			X		X									
47	X						X			X		X									
48	X				X	X	X	X		X	X	X									
49	X	X			X	X	X			X	X	X									
50	natural selection,	X			X		X	X	**E8- Evolution by natural selection, diversity of life**			X	**E8- Evolution by natural selection, diversity of life**								
51		X		X	X	X	X	X				X									
52		X			X		X	X				X									

	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL
2	Chemistry												Mathematics				Physics				
3	CH 3141	4403+ Lab)	CH 4411	CH 4413	CH 4421	CH 4423	CH 4511	CH 4513	CH 4521	CH 4523	CH 4554	CH 4564	MA 1713	MA 1723	MA/ST 2113	MA/ST3123	PH 1113	PH 1123	PH 1133	PH 2213	PH 2223
4	Professional Chemistry: Literature	Biophysical Chemistry	Physical Chemistry Laboratory I	Thermodynamics and Kinetics	Physical Chemistry Laboratory II	Quantum Mechanics and Spectroscopy	Organic Chemistry Laboratory I	Organic Chemistry I	Organic Chemistry Laboratory II	Organic Chemistry II	Integrated Organic Chemistry I	Integrated Organic Chemistry II	Calculus I	Calculus II	Intro to Stats	Stat. Inference	General Physics I	General Physics II	General Physics III	Physics I	Physics II
5	CH 2141	PH 1123, CH 4523, MA 1723	CH 4413 concurrent	CH 1223, PH 2213 or PH 1113, MA 1723	CH 4423 concurrent	CH 1223, PH 2213 or PH 1113, MA 1723	CH 1221, CH 1223, credit or enrollment in CH 4513	CH 1223	CH 4511, CH 4513, credit or enrollment in CH 4523	CH 4513	CH 1221, CH 1223 or CH 1244	CH 4511, CH 4513 or CH 4554	MA 1323	MA 1713	MA 1313	MA 1313	MA 1313, MA 1323 or registration in MA 1713	PH 1113	PH 1113	Grade ≥C in MA 1713	PH 2213, MA 1723
6	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y
7	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
8	**E1- Apply quantitative reasoning/mathematics to phenomena in the natural world**																**E1- Apply quantitative reasoning/mathematics to phenomena in the natural world**				
9														X			X	X	X	X	X
10													X	X	X	X	X	X	X	X	X
11														X	X	X	X (lab)	X (lab)	X (lab)	X (lab)	X (lab)
12	X													X	X	X					
13			X										X	X	X	X	X	X	X	X	X
14	X												X	X	X	X	X	X	X	X	X
15													X	X			X	X	X	X	X
16							X		X				**E2- Scientific inquiry, how scientific knowledge is discovered/validated.**				X	X	X	X	X
17							X		X								X (lab)	X (lab)	X (lab)	X (lab)	X (lab)
18							X		X								X (lab)	X (lab)	X (lab)	X (lab)	X (lab)
19							X		X								X (lab)	X (lab)	X (lab)	X (lab)	X (lab)
20							X		X								X (lab)	X (lab)	X (lab)	X (lab)	X (lab)
21	X						X		X								X	X	X	X	X
22	**E3- Basic physical principles, application to living systems.**												**E3- Basic physical principles, application to living systems.**								
23																	X			X	
24																			X		X
25					X	X												X			X
26			X	X														X			X
27					X	X												X	X		
28				X															X		X
29	**E4- Basic principles of chemistry, application to living systems.**												**E4- Basic principles of chemistry, application to living systems.**								
30							X	X	X	X	X	X							X		
31							X	X	X	X	X	X							X		
32							X	X	X	X	X	X							X		
33																			X		X
34							X	X	X		X								X		X
35							X	X	X	X	X	X									
36	**E5- Biomolecules contribution to structure/function of cells.**												**E5- Biomolecules contribution to structure/function of cells.**								
37										X	X	X									
38		X	X																		
41	**E6- Molecular/cell assemblies, organs & organisms develop structure/function.**												**E6- Molecular/cell assemblies, organs & organisms develop structure/function.**								
45																	X	X		X	X
50	**E8- Evolution by natural selection, diversity of life**												**E8- Evolution by natural selection, diversity of life**								

	BM	BN
1		
2		
3	PH 2233	
4	Physics III	**Entering Student Competency (E1, E2, E3,…) and Learning Objectives (1,2,3..)**
5	PH 2223	
6	Y	
7	Y	
8		**E1- Apply quantitative reasoning and appropriate mathematics to describe or explain phenomena in the natural world**
9	X	1. Demonstrate quantitative numeracy and facility with the language of mathematics.
10	X	2. Interpret data sets and communicate those interpretations using visual and other appropriate tools.
11	X (lab)	3. Make statistical inferences from data sets.
12		4. Extract relevant information from large data sets.
13	X	5. Make inferences about natural phenomena using mathematical models.
14	X	6. Apply algorithmic approaches and principles of logic (including the distinction between cause/effect and association) to problem solving.
15	X	7. Quantify and interpret changes in dynamical systems.
16	X	**E2- Demonstrate understanding of the process of scientific inquiry, and explain how scientific knowledge is discovered and validated.**
17	X (lab)	1. Develop observational and interpretive skills through hands-on laboratory or field experiences.
18	X (lab)	2. Demonstrate ability to measure with precision, accuracy, and safety.
19	X (lab)	3. Be able to operate basic laboratory instrumentation for scientific measurement.
20	X (lab)	4. Be able to articulate (in guided inquiry or in project-based research) scientific questions and hypotheses, design experiments, acquire data, perform data analysis, and present results.
21	X	5. Demonstrate the ability to search effectively, to evaluate critically, and to communicate and analyze the scientific literature.
22		**E3- Demonstrate knowledge of basic physical principles and their applications to the understanding of living systems.**
23		1. Demonstrate understanding of mechanics as applied to human and diagnostic systems.
24		2. Demonstrate knowledge of the principles of electricity and magnetism (e.g., charge, current flow, resistance, capacitance, electrical potential, and magnetic fields).
25		radiation.
26		4. Demonstrate knowledge of the principles of thermodynamics and fluid motion.
27	X	5. Demonstrate knowledge of principles of quantum mechanics, such as atomic and molecular energy levels, spin, and ionizing radiation.
28		6. Demonstrate knowledge of principles of systems behavior, including input–output relationships and positive and negative feedback.
29		**E4- Demonstrate knowledge of basic principles of chemistry and some of their applications to the understanding of living systems.**
30	X	1. Demonstrate knowledge of atomic structure.
31	X	2. Demonstrate knowledge of molecular structure.
32	X	3. Demonstrate knowledge of molecular interactions.
33		4. Demonstrate knowledge of thermodynamic criteria for spontaneity of physical processes and chemical reactions and the relationship of thermodynamics to chemical equilibrium.
34		5. Demonstrate knowledge of principles of chemical reactivity to explain chemical kinetics and derive possible reaction mechanisms.
35		6. Demonstrate knowledge of the chemistry of carbon-containing compounds relevant to their behavior in an aqueous environment.
36		**E5- Demonstrate knowledge of how biomolecules contribute to the structure and function of cells.**
37		1. Demonstrate knowledge of the structure, biosynthesis, and degradation of biological macromolecules.
38		2. Demonstrate knowledge of the principles of chemical thermodynamics and kinetics that drive biological processes in the context of space (i.e., compartmentation) and time: enzyme-catalyzed reactions and metabolic pathways, regulation, integration, and the chemical logic of sequential reaction steps.
39		3. Demonstrate knowledge of the biochemical processes that carry out transfer of biological information from DNA, and how these processes are regulated.
40		4. Demonstrate knowledge of the principles of genetics and epigenetics to explain heritable traits in a variety of organisms.
41		**E6- Apply understanding of principles of how molecular and cell assemblies, organs, and organisms develop structure and carry out function.**
42		1. Employ knowledge of the general components of prokaryotic and eukaryotic cells, such as molecular, microscopic, macroscopic, and three-dimensional structure, to explain how different components contribute to cellular and organismal function.
43		2. Demonstrate knowledge of how cell–cell junctions and the extracellular matrix interact to form tissues with specialized function.
44		3. Demonstrate knowledge of the mechanisms governing cell division and development of embryos.
45		4. Demonstrate knowledge of the principles of biomechanics and explain structural and functional properties of tissues and organisms.
46		**E7- Explain how organisms sense and control their internal environment and how they respond to external change.**
47		1. Explain maintenance of homeostasis in living organisms by using principles of mass transport, heat transfer, energy balance, and feedback and control systems.
48		2. Explain physical and chemical mechanisms used for transduction and information processing in the sensing and integration of internal and environmental signals.
49		3. Explain how living organisms use internal and external defense and avoidance mechanisms to protect themselves from threats, spanning the spectrum from behavioral to structural and immunologic responses.
50		**E8- Demonstrate an understanding of how the organizing principle of evolution by natural selection explains the diversity of life on earth.**
51		1. Explain how genomic variability and mutation contribute to the success of populations.
52		2. Explain how evolutionary mechanisms contribute to change in gene frequencies in populations and to reproductive isolation.