BIOMEDICAL COMPUTATION

The Biomedical Computation major allows students to focus on a particularly exciting area of biotechnology—the use of advanced computational techniques in biology and medicine.

Biomedical Computation spans many different fields of study. To provide some structure to the major, the faculty members who are involved in the project have proposed the following organizational chart to illustrate the breadth of the field. Along the top is an axis that indicates the biological scale that serves as the focus of the work. Research in the world of microbiology lies on the left, while the larger-scale systems fall on the right. The axis labeled along the left side shows two core technologies on the computation side. The first is a focus on managing and manipulating data derived from biological systems; the second concerns using computers to simulate those systems.

	Molecular and Cellular	**Organs and Organisms**
Informatics		
Simulation		

Majors in Biomedical Computation do not occupy a single cell in this matrix, but rather a complete axis, either horizontal or vertical. If, for example, a student chooses "Molecular and Cellular" as their primary axis, they will take courses on both the informatics and simulation side. Similarly, a student focusing on "Simulation" will work at both biological scales.

Developing a program plan in Biomedical Computation will require you to get the advice of faculty on the committee that oversees the program. Admission to this concentration is limited by the availability of faculty; consult with those faculty members to ensure that there are adequate resources to support you in the program.

Biomedical Computation

Molecular and Cellular

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	MATH 41	5	-	-	MATH 42	5	-	-	CS107	-	5	-
	CHEM 31X	4	-	-	CHEM 33	4	-	-	STAT 116	5	-	-
	CS106A	-	4	-	CS106B	-	4	-				
	Subtotals	*9*	*4*	*0*	*Subtotals*	*9*	*4*	*0*	*Subtotals*	*5*	*5*	*0*
	Total			13	Total			13	Total			10
Sophomore	BIOSCI 41	5	-	-	BIOSCI 42	5	-	-	BIOSCI 43	5	-	-
	CS103A	-	3	-	CS103B	-	3	-				
	STAT 141	4	-	-	PHYS 41	4	-	-				
	Subtotals	*9*	*3*	*0*	*Subtotals*	*9*	*3*	*0*	*Subtotals*	*5*	*0*	*0*
	Total			12	Total			12	Total			5
Junior	Info Elective	-	3	-	BIOSCI 129A	4	-	-	BIOSCI 129B	4	-	-
	E30	-	3	-	BIOSCI 188	5	-	-	Simul elct	-	3	-
	E130	-	4	-	BMI 210	-	3	-				
	Subtotals	*0*	*10*	*0*	*Subtotals*	*9*	*3*	*0*	*Subtotals*	*4*	*3*	*0*
	Total			10	Total			12	Total			7
Senior	Genetics 203	4	-	-	CS/ME191	-	3	-	CS/ME191	-	3	-
	Elective	-	-	3	Info elective	-	3	-	Simul elct	-	3	-
	Subtotals	*4*	*0*	*3*	*Subtotals*	*0*	*6*	*0*	*Subtotals*	*0*	*6*	*0*
	Total			7	Total			6	Total			6

Total Math & Science Units:	63
Total Engineering Units:	47
Total Other Units:	3
Total Units:	113

Biomedical Computation

Organs and Organisms

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	MATH 41	5	-	-	MATH 42	5	-	-	CS107	-	5	-
	CHEM 31X	4	-	-	CHEM 33	4	-	-	STAT 116	5	-	-
	CS106A	-	4		CS106B	-	4	-				
	Subtotals	*9*	*4*	*0*	*Subtotals*	*9*	*4*	*0*	*Subtotals*	*5*	*5*	*0*
	Total			13	Total			13	Total			10
Sophomore	BIOSCI 41	5	-	-	BIOSCI 42	5	-	-	BIOSCI 43	5	-	-
	CS103A	-	3	-	CS103B	-	3	-				
	MATH 51	5	-	-	PHYS 53	4	-	-				
	Subtotals	*10*	*3*	*0*	*Subtotals*	*9*	*3*	*0*	*Subtotals*	*5*	*0*	*0*
	Total			13	Total			12	Total			5
Junior	ENGR 30	-	3	-	BIOSCI 112	4	-	-	Elective	3	-	-
	Organs elect	3	-	-	BIOSCI 188	5	-	-	Simul elct	-	3	-
					CS 201	-	4	-				
	Subtotals	*3*	*3*	*0*	*Subtotals*	*9*	*4*	*0*	*Subtotals*	*3*	*3*	*0*
	Total			6	Total			13	Total			6
Senior	Info Elective	-	3	-	CS/ME191	-	3	-	CS/ME191W	-	3	-
	Simul elct	-	3	-	BMI 210	-	3	-	Info elective	-	3	-
	Subtotals	*0*	*6*	*0*	*Subtotals*	*0*	*6*	*0*	*Subtotals*	*0*	*6*	*0*
	Total			6	Total			6	Total			6

Total Math & Science Units:	62
Total Engineering Units:	47
Total Other Units:	0
Total Units:	109

Biomedical Computation

Simulation

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	MATH 41	5	-	-	MATH 42	5	-	-	ENGR14	-	3	-
	CHEM 31X	4	-	-	CHEM 33	4	-	-	PHYS 43	3	-	-
	CS106X	-	5	-	PHYS 41	4	-	-	MATH 51	5	-	-
	Subtotals	*9*	*5*	*0*	*Subtotals*	*13*	*0*	*0*	*Subtotals*	*8*	*3*	*0*
	Total			14	Total			13	Total			11
Sophomore	BIOSCI 41	5	-	-	BIOSCI 42	5	-	-	BIOSCI 43	5	-	-
	ENGR 15	-	3	-	ENGR155A	-	5	-	ENGR155B	-	5	-
	ENGR 30	-	3	-								
	Subtotals	*5*	*6*	*0*	*Subtotals*	*5*	*5*	*0*	*Subtotals*	*5*	*5*	*0*
	Total			11	Total			10	Total			10
Junior	CS107	-	5	-	Simul Elct	-	3	-	Simul Elct	-	3	-
	CS103A	-	3	-	BIOSCI Electiv	3	-	-	BIOSCI Electiv	3	-	-
					CS103B	-	3	-	STAT 116	5	-	-
	Subtotals	*0*	*8*	*0*	*Subtotals*	*3*	*6*	*0*	*Subtotals*	*8*	*3*	*0*
	Total			8	Total			9	Total			11
Senior	BMI 210	-	3	-	ME 191	-	3	-	ME 191W	-	3	-
					CS 201	-	4	-				
	Subtotals	*0*	*3*	*0*	*Subtotals*	*0*	*7*	*0*	*Subtotals*	*0*	*3*	*0*
	Total			3	Total			7	Total			3

Total Math & Science Units:	56
Total Engineering Units:	54
Total Other Units:	0
Total Units:	110

Biomedical Computation

Informatics (early)

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	MATH 41	5	-	-	MATH 42	5	-	-	CS107	-	5	-
	CHEM 31X	4	-	-	CHEM 33	4	-	-	ENGR 62	-	4	-
	CS106X	-	5	-	PHYS 41	4	-	-	STAT 116	5	-	-
	Subtotals	*9*	*5*	*0*	*Subtotals*	*13*	*0*	*0*	*Subtotals*	*5*	*9*	*0*
	Total			14	Total			13	Total			14
Sophomore	BIOSCI 41	5	-	-	BIOSCI 42	5	-	-	BIOSCI 43	5	-	-
	CS103A	-	3	-	CS103B	-	3	-	CS145	-	4	-
	STAT 141	4	-	-	CS 201	-	4	-				
	Subtotals	*9*	*3*	*0*	*Subtotals*	*5*	*7*	*0*	*Subtotals*	*5*	*4*	*0*
	Total			12	Total			12	Total			9
Junior	CS161	-	4	-	Cellular Elct	3	-	-	Info Elective	-	3	-
	CS 221	-	4	-	Info Elective	-	-	-	Organs Elct	3	-	-
	Subtotals	*0*	*8*	*0*	*Subtotals*	*3*	*0*	*0*	*Subtotals*	*3*	*3*	*0*
	Total			8	Total			3	Total			6
Senior	Info Elective	-	3	-	CS191	-	3	-	Cellular Elct	3	-	-
	BMI 210	-	3	-	Organs Elct	3	-	-	CS191W	-	3	-
					Info Elective	-	3	-				
	Subtotals	*0*	*6*	*0*	*Subtotals*	*3*	*6*	*0*	*Subtotals*	*3*	*3*	*0*
	Total			6	Total			9	Total			6

Total Math & Science Units:	58
Total Engineering Units:	54
Total Other Units:	0
Total Units:	112

Biomedical Computation

Informatics (late)

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	MATH 41	5	-	-	MATH 42	5	-	-				
					PHYS 41	4	-	-				
	Subtotals	*5*	*0*	*0*	*Subtotals*	*9*	*0*	*0*	*Subtotals*	*0*	*0*	*0*
	Total			5	Total			9	Total			0
Sophomore	STAT 116	5	-	-	CS103A	-	3	-	CS103B	-	3	-
	CHEM 31X	4	-	-	CHEM 33	4	-	-	CS107	-	5	-
	CS106A	-	4		CS106B	-	4	-	ENGR 62	-	4	-
	Subtotals	*9*	*4*	*0*	*Subtotals*	*4*	*7*	*0*	*Subtotals*	*0*	*12*	*0*
	Total			13	Total			11	Total			12
Junior	BIOSCI 41	5	-	-	BIOSCI 42	5	-	-	BIOSCI 43	5	-	-
	STAT 141	4	-	-	CS 201	-	4	-	CS145	-	4	-
	CS161	-	4	-	CS121	-	3	-	Info Elective	-	3	-
	Subtotals	*9*	*4*	*0*	*Subtotals*	*5*	*7*	*0*	*Subtotals*	*5*	*7*	*0*
	Total			13	Total			12	Total			12
Senior	Cellular Elct	3	-	-	CS191	-	3	-	Organs Elct	3	-	-
	BMI 210	-	3	-	Cellular Elct	3	-	-	CS191W	-	3	-
	Organs Elct	3	-	-	Info elective	-	3	-	Info Elective	-	3	-
	Subtotals	*6*	*3*	*0*	*Subtotals*	*3*	*6*	*0*	*Subtotals*	*3*	*6*	*0*
	Total			9	Total			9	Total			9

Total Math & Science Units:	58
Total Engineering Units:	56
Total Other Units:	0
Total Units:	114

INSTRUCTIONS FOR DECLARING MAJOR IN ENGINEERING: BIOMEDICAL COMPUTATION (BSE: BMC)

1. Gather information about the major by talking to students and professors.
2. Design a 4-year plan based on the samples previous pages.
3. Print a copy of your transcript from Axess.
4. Select an advisor (choose from the list of faculty listed under "BMC Faculty Advisors" on the BMC website at http://bmc.stanford.edu).
5. Download the BSE:BMC program sheet from the School of Engineering web site (http://ughb.stanford.edu).
6. Meet with your advisor to review the 4-year plan
7. Based on your plan, fill out your program sheet
8. Meet with either Prof. Russ Altman or Prof. Daphne Koller to get approval; have them sign your program sheet.
9. Turn in your completed and signed Program Sheet, 4-Year Plan, and an unofficial Stanford transcript to Darlene Lazar in Terman 201. She will review for completion and pass to Bertha Love for approval.
10. When your major is approved, Bertha will notify you via email. You must then declare your major in Axess:
    a. Select "Engineering" as your Major
    b. Select "BMC" as your subplan
    c. Ask Bertha Love (love@stanford.edu) to approve your major in PeopleSoft

Stanford University ♦ School of Engineering

BioMedical Computation - Molecular and Cellular Track

2006-2007 Sample Program Sheet

Final version of completed and signed program due to the department no later than one month prior to the last quarter of senior year.

Name: _____ SU ID: _____

Local Address: _____ Local Phone: _____

_____ Email: _____

_____ Date B.S. expected: _____

Mathematics and Science Requirement (Delete courses not taken)

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval Initials	Transfer/AP Approval Date
Mathematics (21 units minimum)							
MATH	41	Calculus	5				
MATH	42	Calculus	5				
STAT	116	Probability	5				
CS 103X or		Discrete Structures (accelerated	4				
CS 103A and 103B		or regular sequence)	or 6				
Math 51 or		Advanced Calculus or	5				
Stat 141		Biostatistics	or 4				
		Mathematics Unit Total		*(24 units minimum)*			
Science (17 units minimum)							
PHYS	41	Mechanics	4				
CHEM 31A&B		Chemical Principles (regular sequence	8				
or CHEM 31X		or accelerated)	or 4				
CHEM	33	Structure & Reactivity	4				
BIOSCI	41	Genetics, Biochemistry, and Molecular Biology	5				
BIOSCI	42	Cell Biology and Animal Physiology	5				
BIOSCI	43	Plant Biology, Evolution, and Ecology	5				
		Science Unit Total	31	*(17 units minimum)*			
				(41 units minimum)			

Technology in Society Requirement (1 course required; see UGHB, Fig. 3-3 for approved list)

Engineering Fundamentals (2 courses required)

CS	106	Programming Abstractions (A&B or X)	5				
		Elective (see note 1)	3				
		Engineering Fundamentals Total					

NOTES

* This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
* All courses listed on this form must be taken for a letter grade if offered by the instructor.
* Minimum Combined Grade Point Average for all courses in the major (combined) is 2.0.
* Transfer and AP credits in Math, Science, Funds., & TIS must be approved by the SoE Dean's office. Transfer credits in Engineering Depth must be approved by the Advisor. Transfer credit information and petitions are available at http://ughb.stanford.edu/transfer.html.
* All courses listed on this form must only be included under one category. Delete courses not taken.

(1) One course required, 3 to 5 units. See Engineering Fundamentals list in School of Engineering Handbook.

program sheet continues on page 2

BioMedical Computation - Molecular and Cellular (continued)

BMC Depth *(46 units minimum; delete courses not taken)*

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Biology Depth (4 courses required)							
BIOSCI	129A	Cellular Dynamics I: Cell Motility and Adhesion	4				
BIOSCI	129B	Cellular Dynamics II: Building a Cell	4				
BIOSCI	188	Biochemistry	5				
or CHEM	135	Physical Chemistry	or 3				
or CHEM	171	Physical Chemistry	or 3				
BIOSCI	203	Advanced Genetics	4				
or BIOSCI	118	Genetics	or 5				
		Biology Depth Total	17				
Engineering Depth *(see note 2; Be advised, no course may be listed twice on this sheet. No double-counting.)*							
Programming (1 course required)							
CS	107	Programming Paradigms	5				
BMC Core Depth							
BMI	210	Biomedical Informatics	3				
or BMI	214	Rep. and Algorithms for Comp. Bio.	or 4				
Research (6 units required)							
CS/ME	191W	Research Project (see note 3)	6				
Simulation Electives (2 courses required: see note 4)							
Informatics Electives (2 courses required: see note 5)							
General Elective (1 course required: see note 6)							
		Engineering Depth Total	14				
		BMC Depth Total		*(46 units minimum)*			

Program Totals

Mathematics and Science		*(41 units minimum)*
BMC Depth		*(46 units minimum)*
Engineering (Fundamentals + Depth) Units		*(40 units minimum)*

Program Approvals

Advisor

Printed Name: _____ Date: _____

Signature: _____

Departmental

Printed Name: _____ Date: _____

Signature: _____

School of Engineering

Printed Name: _____ Date: _____

Signature: _____

NOTES (continued from page 1)

(2) 40 units of engineering courses are required, to be met through the Engineering Fundamentals and BMC Depth courses.

(3) Fulfills the "Writing in the Major" requirement for Freshman and Transfer students entering Fall 1996 or later. For research outside of CS, ENGR199W (recommended), CS201, CS272, Bio 54, or Bio 55 may be used to fulfill WIM.

(4) The simulation electives must be chosen from the following: ENGR14, ENGR15, ENGR30, ME33, ME80, ME280, ME281, ME284A, CS223A, CS248, CS273, CS326A, SBIO228, CHEM171.

(5) The informatics electives must be chosen from the following: CS161, CS145, CS121, CS221, CS147, CS222, CS228, CS229, CS262, BMI211, BMI214, BIOC218, MGTSC252, STAT206, STAT315A, GENE211.

(6) The additional elective must be chosen from the lists in notes (4) or (5), or from the following: BIO118, BIO133, SBIO228, BIO214, CS262, BMI214, BIOC218, GENE211, GENE344.

Stanford University ♦ School of Engineering

BioMedical Computation - Organs and Organisms Track

2006-2007 Sample Program Sheet

Final version of completed and signed program due to the department no later than one month prior to the last quarter of senior year.

Name: _____ SU ID: _____

Local Address: _____ Local Phone: _____

_____ Email: _____

_____ Date B.S. expected: _____

Mathematics and Science Requirement (Delete courses not taken)

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval Initials	Transfer/AP Approval Date
Mathematics (21 units minimum)							
MATH	41	Calculus	5				
MATH	42	Calculus	5				
STAT	116	Probability	5				
CS 103X or		Discrete Structures (accelerated	4				
CS 103A and 103B		or regular sequence)	or 6				
Math 51 or		Advanced Calculus or	5				
Stat 141		Biostatistics	or 4				
		Mathematics Unit Total		*(21 units minimum)*			
Science (17 units minimum)							
PHYS	41	Mechanics	4				
CHEM 31A&B		Chemical Principles (regular sequence	8				
or CHEM 31X		or accelerated)	or 4				
CHEM	33	Structure & Reactivity	4				
BIOSCI	41	Genetics, Biochemistry, and Molecular Biology	5				
BIOSCI	42	Cell Biology and Animal Physiology	5				
BIOSCI	43	Plant Biology, Evolution, and Ecology	5				
		Science Unit Total	31	*(17 units minimum)*			
				(40 units minimum)			

Technology in Society Requirement (1 course required; see UGHB, Fig. 3-3 for approved list)

Engineering Fundamentals (2 courses required)

CS	106	Programming Abstractions (A&B or X)	5				
		Elective (see note 1)	3				
		Engineering Fundamentals Total					

NOTES

* This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.

* All courses listed on this form must be taken for a letter grade if offered by the instructor.

* Minimum Combined Grade Point Average for all courses in the major (combined) is 2.0.

* Transfer and AP credits in Math, Science, Fundamentals, & TIS must be approved by the SoE Dean's office. Transfer credits in Engineering Depth must be approved by the Advisor. Transfer credit information and petitions are available at http://ughb.stanford.edu/transfer.html.

* All courses listed on this form must only be included under one category. Delete courses not taken.

(1) One course required, 3 to 5 units. See Engineering Fundamentals list in School of Engineering Handbook.

program sheet continues on page 2

BioMedical Computation - Organs and Organisms (continued)

BMC Depth *(46 units minimum; delete courses not taken)*

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Biology Depth (4 courses required)							
BIOSCI	112	Human Physiology	4				
BIOSCI	188	Biochemistry	5				
		Organs Electives (2 courses required: see note 2)					
		Biology Depth Total					
Engineering Depth *(see note 3; Be advised, no course may be listed twice on theis sheet. No double-counting.)*							
Programming (1 course required)							
CS	107	Programming Paradigms	5				
BMC Core Depth							
BMI	210	Biomedical Informatics	3				
or BMI	214	Rep. and Algorithms for Comp. Bio.	or 4				
CS/ME	191	Research Project (see note 4)	6				
Simulation Electives (2 courses required: see note 5)							
Informatics Electives (2 courses required: see note 6)							
General Elective (1 course required: see note 7)							
		Engineering Depth Total	14				
		BMC Depth Total		*(46 units minimum)*			

Program Totals

Mathematics and Science		*(41 units minimum)*
BMC Depth		*(46 units minimum)*
Engineering (Fundamentals + Depth) Units		*(40 units minimum)*

Program Approvals

Advisor

Printed Name: _____ Date: _____

Signature: _____

Departmental

Printed Name: _____ Date: _____

Signature: _____

School of Engineering

Printed Name: _____ Date: _____

Signature: _____

NOTES (continued from page 1)

(2) The Organs electives must be chosen from the following set: BIOSCI112, BIOSCI188, SURG101, BIOSCI158, BIOSCI214, BIOSCI230, BIOSCI283, ME280, ME281, ME84A, DBIO210.

(3) 40 units of engineering courses are required, to be met through the Engineering Fundamentals and BMC Depth courses.

(4) Fulfills the "Writing in the Major" requirement for Freshman and Transfer students entering Fall 1996 or later. For research outside of CS, ENGR199W (recommended), CS201, CS272, Bio 54, or Bio 55 may be used to fulfill WIM.

(5) The simulation electives must be chosen from the following: ENGR14, ENGR15, ENGR30, ME33, ME80, ME280, ME281, ME284A, CS223A, CS248, CS326A, CS273, SBIO228, CHEM171.

(6) The informatics electives must be chosen from the following: CS161, CS145, CS121, CS221, CS147, CS222, CS228, CS229, CS262, BMI211, BMI214, BIOC218, MGTSC252, STAT206, STAT315A, GENE211.

(7) The additional elective must be chosen from the lists in notes (4) or (5), or from the following: BIO118, BIO133, SBIO228, BIO214, CS262, BMI214, BIOC218, GENE211, GENE344.

Stanford University ♦ School of Engineering

BioMedical Computation - Simulation Track

2006-2007 Sample Program Sheet

Final version of completed and signed program due to the department no later than one month prior to the last quarter of senior year.

Name: _____ SU ID: _____

Local Address: _____ Local Phone: _____

_____ Email: _____

_____ Date B.S. expected: _____

Mathematics and Science Requirement (Delete courses not taken)

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval Initials	Transfer/AP Approval Date
Mathematics (21 units minimum)							
MATH	41	Calculus	5				
MATH	42	Calculus	5				
STAT	116	Probability	5				
CS 103X or		Discrete Structures (accelerated	4				
CS 103A and 103B		or regular sequence)	or 6				
MATH	51	Advanced Calculus I	5				
MATH 52 or ENGR 155A		Advanced Calculus II	5				
MATH 53 or ENGR 155B		Advanced Calculus III	5				
		Mathematics Unit Total		*(21 units minimum)*			
Science (17 units minimum)							
PHYS	41	Mechanics	4				
PHYS	45 or 43	Electricity & Magnetism or Optics & Thermodynamics	3				
CHEM 31A&B		Chemical Principles (regular sequence	8				
or CHEM 31X		or accelerated)	or 4				
CHEM	33	Structure & Reactivity	4				
BIOSCI	41	Genetics, Biochemistry, and Molecular Biology	5				
BIOSCI	42	Cell Biology and Animal Physiology	5				
BIOSCI	43	Plant Biology, Evolution, and Ecology	5				
		Science Unit Total	34	*(17 units minimum)*			
				(40 units minimum)			

Technology in Society Requirement (1 course required; see UGHB, Fig. 3-3 for approved list)

Engineering Fundamentals (2 courses required)

CS	106	Programming Abstractions (A&B or X)	5				
ENGR	30	Eng. Thermodynamics	3				
		Engineering Fundamentals Total					

NOTES

* This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
* All courses listed on this form must be taken for a letter grade if offered by the instructor.
* Minimum Combined Grade Point Average for all courses in the major (combined) is 2.0.
* Transfer and AP credits in Math, Science, Fundamentals, & TIS must be approved by the SoE Dean's office. Transfer credits in Engineering Depth must be approved by the Advisor. Transfer credit information and petitions are available at http://ughb.stanford.edu/transfer.html.
* All courses listed on this form must only be included under one category. Delete courses not taken.

program sheet continues on page 2

BioMedical Computation - Simulation Track (continued)

BMC Depth *(46 units minimum; delete courses not taken)*

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Engineering Depth (*see note 1* ***-*** *Be advised, no course may be listed twice on this sheet. No double-counting.* ***)***							
Programming (1 course required)							
CS	107	Programming Paradigms	5				
BMC Core Depth (see note 2)							
BMI	210	Biomedical Informatics	3				
or BMI	214	Rep. and Algorithms for Comp. Bio.	or 4				
Research (6 units required)							
CS/ME	191	Research Project (see note 3)	6				
Simulation Electives (2 courses required: see note 4)							
Cellular Electives (3 units required: see note 5)							
			3				
Organs Electives (3 units required: see note 6)							
			3				
		Engineering Depth Total	20				

BMC Depth Total _____ *(46 units minimum)*

Program Totals

Mathematics and Science _____ *(41 units minimum)*
BMC Depth _____ *(46 units minimum)*
Engineering (Fundamentals + Depth) Units _____ *(40 units minimum)*

Program Approvals

Advisor
Printed Name: _____ Date: _____
Signature: _____

Departmental
Printed Name: _____ Date: _____
Signature: _____

School of Engineering
Printed Name: _____ Date: _____
Signature: _____

NOTES (continued from page 1)

(1) 40 units of engineering courses are required, to be met through the Engineering Fundamentals and BMC Depth courses.

(2) The simulation core courses must be chosen from: ENGR14, ENGR15, ME33, ME80. Note that different subsets of these courses are required for different continuation courses in the track.

(3) Fulfills the "Writing in the Major" requirement for Freshman and Transfer students entering Fall 1996 or later. For research outside of CS, ENGR199W (recommended), CS201, CS272, Bio 54, or Bio 55 may be used to fulfill WIM.

(4) The simulation electives must be chosen from the following: ME280, ME281, ME284A, CS223A, CS248, CS326A, CS273, SBIO228, CHEM171.

(5) The cellular electives must be chosen from the following set: BIOSCI129A, BIOSCI129B, BIOSCI188, BIOSCI203, BIOSCI118, BIOSCI133, SBIO228, BIOSCI214, CS262, BMI214, BIOSCIC218, GENE211, GENE344.

(6) The organs electives must be chosen from the following set: BIOSCI112, BIOSCI188, SURG101, BIOSCI158, BIOSCI214, BIOSCI230, BIOSCI283, ME280, ME281, ME284A, DBIO210.

Stanford University ♦ School of Engineering

BioMedical Computation - Informatics Track

2006-2007 Sample Program Sheet

Final version of completed and signed program due to the department no later than one month prior to the last quarter of senior year.

Name: _____ SU ID: _____

Local Address: _____ Local Phone: _____

_____ Email: _____

_____ Date B.S. expected: _____

Mathematics and Science Requirement (Delete courses not taken)

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Mathematics (21 units minimum)							
MATH	41	Calculus	5				
MATH	42	Calculus	5				
STAT	116	Theory of Probability	5				
CS 103X or		Discrete Structures (accelerated	4				
CS 103A and 103B		or regular sequence)	or 6				
STAT	141	Biostatistics	4				
		Mathematics Unit Total		*(21 units minimum)*			
Science (17 units minimum)							
PHYS	41	Mechanics	4				
CHEM 31A&B		Chemical Principles (regular sequence	8				
or CHEM 31X		or accelerated)	or 4				
CHEM	33	Structure & Reactivity	4				
BIOSCI	41	Genetics, Biochemistry, and Molecular Biology	5				
BIOSCI	42	Cell Biology and Animal Physiology	5				
BIOSCI	43	Plant Biology, Evolution, and Ecology	5				
		Science Unit Total	31	*(17 units minimum)*			
				(40 units minimum)			

Technology in Society Requirement (1 course required; see UGHB, Fig. 3-3 for approved list)

Engineering Fundamentals (2 courses required)

CS	106	Programming Abstractions (A&B or X)	5				
		Elective (see note 1)	3				
		Engineering Fundamentals Total					

NOTES

* This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
* All courses listed on this form must be taken for a letter grade if offered by the instructor.
* Minimum Combined Grade Point Average for all courses in the major (combined) is 2.0.
* Transfer and AP credits in Math, Science, Fundamentals, & TIS must be approved by the SoE Dean's office. Transfer credits in Engineering Depth must be approved by the Advisor. Transfer credit information and petitions are available at http://ughb.stanford.edu/transfer.html.
* All courses listed on this form must only be included under one category. Delete courses not taken.

(1) One course required, 3 to 5 units. See Engineering Fundamentals list in School of Engineering Handbook.

program sheet continues on page 2

BioMedical Computation - Informatics Track (continued)

BMC Depth *(46 units minimum; delete courses not taken)*

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Engineering Depth *(see note 2; Be advised, no course may be listed twice on this sheet. No double-counting.* ***)***							
Programming (1 course required)							
CS	107	Programming Paradigms	5				
BMC Core Depth							
BMI	210	Biomedical Informatics	3				
or BMI	214	Rep. and Algorithms for Comp. Bio.	or 4				
CS	145	Databases	4				
CS	161	Design and Analysis of Algorithms	4				
CS	121/221	Artificial Intelligence	3				
Research (6 units required)							
CS/ME	191	Research Project (see note 3)	6				
Informatics Electives (3 courses required: see note 4)							
			3				
			3				
			3				
Cellular Electives (2 courses required: see note 5)							
			3				
			3				
Organs Electives (2 courses required: see note 6)							
			3				
			3				
		Engineering Depth Total	46				

BMC Depth Total _____ *(46 units minimum)*

Program Totals

Mathematics and Science _____ *(41 units minimum)*

BMC Depth _____ *(46 units minimum)*

Engineering (Fundamentals + Depth) Units _____ *(40 units minimum)*

Program Approvals

Advisor

Printed Name: _____ Date: _____

Signature: _____

Departmental

Printed Name: _____ Date: _____

Signature: _____

School of Engineering

Printed Name: _____ Date: _____

Signature: _____

NOTES (continued from page 1)

(2) 40 units of engineering courses are required, to be met through the Engineering Fundamentals and BMC Depth courses.

(3) Fulfills the "Writing in the Major" requirement for Freshman and Transfer students entering Fall 1996 or later. For research outside of CS, ENGR199W (recommended), CS201, CS272, Bio 54, or Bio 55 may be used to fulfill WIM.

(4) The informatics electives must be chosen from the following: CS147, CS222, CS228, CS229, CS262, BMI211, BMI214, BIOSCI218, MGTSC252, STAT206, STAT315A, GENE211.

(5) The cellular electives must be chosen from the following set: BIOSCI129A, BIOSCI129B, BIOSCI188, BIOSCI203, BIOSCI118, BIOSCI133, SBIO228, BIOSCI214, CS262, CS273, BMI214, BIOSCIC218, GENE211, GENE344.

(6) The organs electives must be chosen from the following set: BIOSCI112, BIO188, SURG101, BIOSCI158, BIOSCI214, BIOSCI230, BIOSCI283, ME280, ME281, ME284A, DBIO210.