BIOMECHANICAL ENGINEERING

The Biomechanical Engineering major integrates biology and clinical medicine with engineering mechanics and design. Research and teaching in the Biomechanical Engineering Group are primarily focused on neuromuscular, musculoskeletal, cardiovascular biomechanics, and cell and tissue mechanics. Research in other areas such as hearing, vision, ocean and plant biomechanics, biomaterials, biosensors, and imaging informatics are also conducted in collaboration with associated faculty in medicine, biology, and engineering.

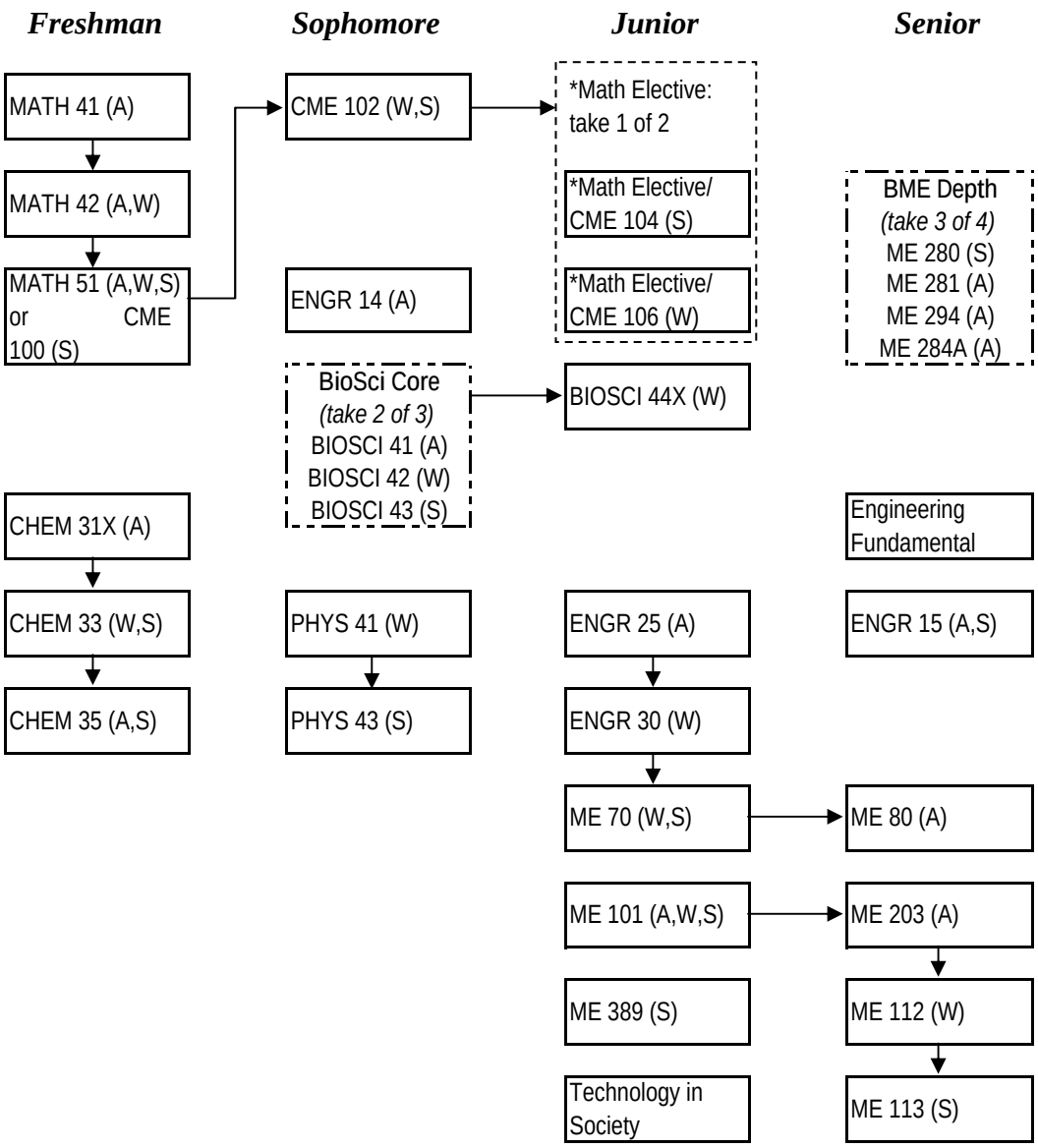
This degree introduces fundamental biological and biophysical principles while developing strengths in traditional engineering areas, specifically mechanical engineering. Primarily geared toward the students' interests, this major offers a plethora of courses for students interested in specific fields of biology and mechanical engineering such as design, biomechanics, and medicine.

The Biomechanical Engineering major provides a fundamental understanding of mechanics in the fields of biology and medicine. However, it is not normally recommended as a terminal degree. This major is well suited for those interested in future graduate studies in bioengineering, medicine, and related areas. The course of study allows students to satisfy many premedical, pre-dental, or pre-paramedical requirements.

Biomechanical Engineering

Typical Sequence of Courses

Starting with Math 40 Series, Chemistry, BioSci, & Design track

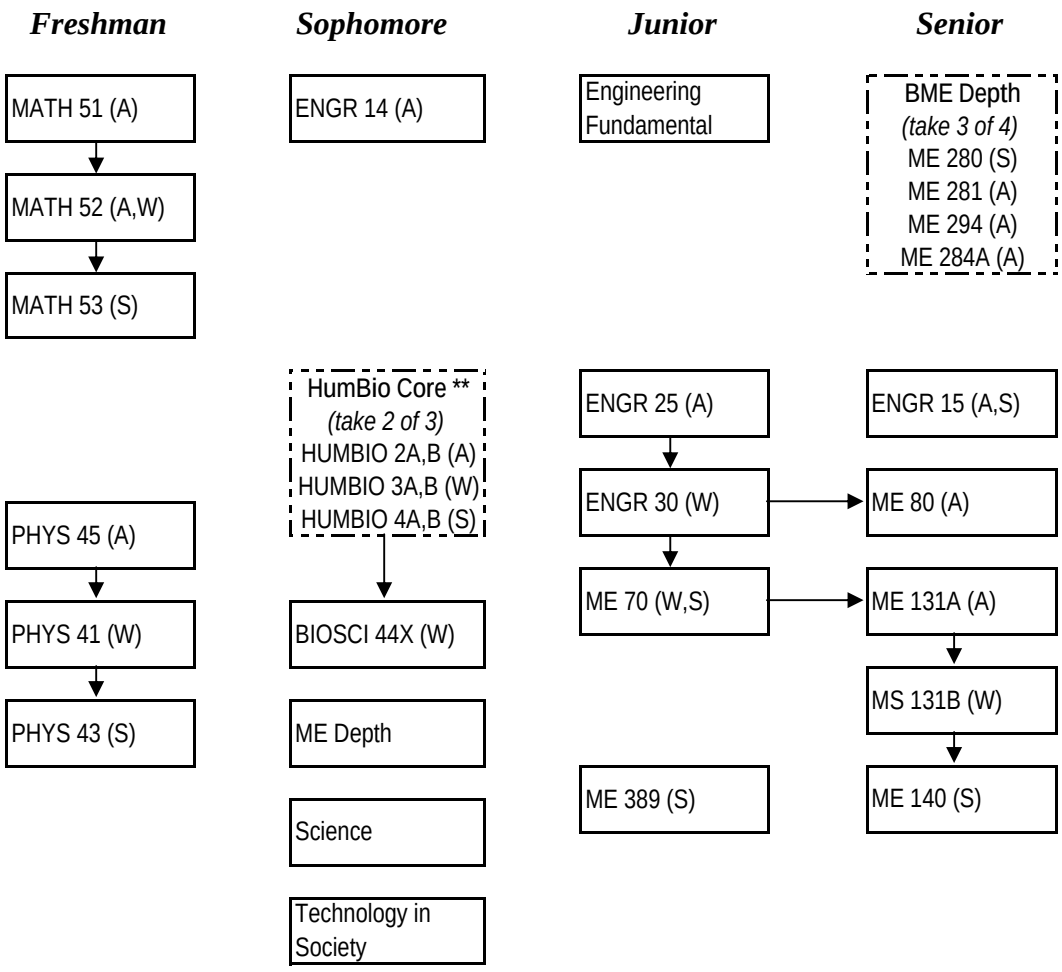


* Arrows represent direct prerequisites
* Dashed-line boxes enclose alternates. These may indicate alternate years in which to take a given course, and/or alternate courses that may be taken at a given time.

Biomechanical Engineering

Typical Sequence of Courses

Starting with Math 50 Series, Physics, HumBio, & Fluids Track



** According to the Human Biology Department, students taking the A series of the HumBio core must also take B series at the same time.

* Arrows represent direct prerequisites
* Dashed-line boxes enclose alternates. These may indicate alternate years in which to take a given course, and/or alternate courses that may be taken at a given time.

Biomechanical Engineering

4 Year Plan: Starting with Math 40 series with Chemistry

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	Writing			3	Writing			3	IHUM			5
	IHUM			5	IHUM			5	Chem 33	4		
	Chem 31A*	4			Chem 31B*	4			Elective			4
	Math 41	5			Math 42	5			GER			3
	Subtotals	*9*	*0*	*8*	*Subtotals*	*9*	*0*	*8*	*Subtotals*	*4*	*0*	*12*
	Total			17	Total			17	Total			16
Sophomore	BioSci 41	5			BioSci 42	5			BioSci 43	5		
	ENGR 14		3		Phys 41	4			ME101		3	
	Chem35		4		ENGR 155A	5			BME Depth		3	
	CME 100	5		3					GER			4
	Subtotals	*10*	*7*	*3*	*Subtotals*	*14*	*0*	*0*	*Subtotals*	*5*	*6*	*4*
	Total			20	Total			14	Total			15
Junior	ENGR 15		3		ENGR 30		3		ENGR 25		3	
	ME 203		4		ME 70		4		Language			5
	ME 103D		1		BioSci 44x	4			GER			5
	Language			5	Language			5	GER			5
	GER			4								
	Subtotals	*0*	*8*	*9*	*Subtotals*	*4*	*7*	*5*	*Subtotals*	*0*	*3*	*15*
	Total			17	Total			16	Total			18
Senior	ME 80/81		4		ME Depth		4		Elective			4
	BME Depth		3		BME Depth		3		GER			5
	ME 389		1		GER			4	Elective			4
	TIS Course			4	Elective			4				
	Subtotals	*0*	*8*	*4*	*Subtotals*	*0*	*7*	*8*	*Subtotals*	*0*	*0*	*13*
	Total			12	Total			15	Total			13

Total Math & Science Units:	55
Total Engineering Units:	46
Total Other Units:	89
Total Units:	190

Notes:

* Chem 31A and 31B may be replaced with Chem31X (accelerated).
* Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Science+Engineering Design Units; see description of "Other Elective Courses" for details.
* Bio44X fulfills the "Writing in the Major" requirement.
* Students who place out of the language requirement should replace language units with technical

Biomechanical Engineering

4 Year Plan: Starting with Math 40 series with Physics

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	Writing			3	Writing			3	IHUM			5
	IHUM			5	IHUM			5	Chem 33	4		
	Math 41	5			Chem 31B*	4			Math 51	5		
	Chem31A*	4			Math 42	5						
	Subtotals	*9*	*0*	*8*	*Subtotals*	*9*	*0*	*8*	*Subtotals*	*9*	*0*	*5*
	Total			17	Total			17	Total			14
Sophomore	BioSci 41	5			BioSci 42	5			Phys 43	4		
	Phys 45	4			Phys 41	4			BME Depth		3	
	Math 52	5			Math 53	5			GER			4
	ENGR 14		3		Engr. Fund.		3		ME Depth		3	
	Subtotals	*14*	*3*	*0*	*Subtotals*	*14*	*3*	*0*	*Subtotals*	*4*	*6*	*4*
	Total			17	Total			17	Total			14
Junior	ENGR 15		3		E30		3		ENGR 25		3	
	ME Depth		4		ME 70		4		Language			5
	Language			5	Bio 44x	4			GER			5
	GER			4	Language			5	ME Depth		3	
	Subtotals	*0*	*7*	*9*	*Subtotals*	*4*	*7*	*5*	*Subtotals*	*0*	*6*	*10*
	Total			16	Total			16	Total			16
Senior	ME 80/81		4		ME Depth		4		Elective			4
	BME Depth		3		BME Depth		3		GER			5
	ME 389		1		GER			4	Elective			4
	TIS Course			4	Elective			4				
	Sci Elective	4										
	Subtotals	*4*	*8*	*4*	*Subtotals*	*0*	*7*	*8*	*Subtotals*	*0*	*0*	*13*
	Total			16	Total			15	Total			13

Total Math & Science Units:	67
Total Engineering Units:	47
Total Other Units:	74
Total Units:	188

Notes:

* Chem 31A and 31B may be replaced with Chem31X (accelerated).
* Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Science+Engineering Design Units; see description of "Other Elective Courses" for details.
* Bio44X fulfills the "Writing in the Major" requirement.
* Students who place out of the language requirement should replace language units with technical electives.

Biomechanical Engineering

4 Year Plan: Starting with CME 100, 102, 104 and BioSci Core

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	Writing			3	Writing			3	IHUM			5
	IHUM			5	IHUM			5	Chem 33	4		
	CME 100		5		Chem 31B*	4			CME 104		5	
	Chem 31A*	4			CME 102		5					
	Subtotals	*4*	*5*	*8*	*Subtotals*	*4*	*5*	*8*	*Subtotals*	*4*	*5*	*5*
	Total			17	Total			17	Total			14
Sophomore	BioSci 41	5			BioSci 42	5			Phys 43	4		
	Phys 45	4			Phys 41	4			BME Depth		3	
	ENGR 14		3		Engr. Fund.		3		GER			4
					Bio 44x	4			ME Depth		3	
	Subtotals	*9*	*3*	*0*	*Subtotals*	*13*	*3*	*0*	*Subtotals*	*4*	*6*	*4*
	Total			12	Total			16	Total			14
Junior	ENGR 15		3		ENGR 30		3		ENGR 25		3	
	ME Depth		4		ME 70		4		Language			5
	Language			5	Language			5	GER			5
	GER			4					ME Depth		3	
	Subtotals	*0*	*7*	*9*	*Subtotals*	*0*	*7*	*5*	*Subtotals*	*0*	*6*	*10*
	Total			16	Total			12	Total			16
Senior	ME 80/81		4		ME Depth		4		Elective			4
	BME Depth		3		BME Depth		3		GER			5
	ME 389		1		GER			4	Elective			4
	TIS Course			4	Elective			4				
	Sci Elective	4										
	Subtotals	*4*	*8*	*4*	*Subtotals*	*0*	*7*	*8*	*Subtotals*	*0*	*0*	*13*
	Total			16	Total			15	Total			13

Total Math & Science Units:	42
Total Engineering Units:	62
Total Other Units:	74
Total Units:	178

Notes:

* Chem 31A and 31B may be replaced with Chem31X (accelerated).
* Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Science+Engineering Design Units; see description of "Other Elective Courses" for details.
* Bio44X fulfills the "Writing in the Major" requirement.
* Students who place out of the language requirement should replace language units with technical electives.

Biomechanical Engineering

4 Year Plan: Starting with Math 50 Series and Human Biology Core

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	Writing			3	Writing			3	IHUM			5
	IHUM			5	IHUM			5	Chem 33	4		
	Math 51	4			Chem 31B*	4			Math 53	5		
	Chem 31A*	5			Math 52	5						
	Subtotals	*9*	*0*	*8*	*Subtotals*	*9*	*0*	*8*	*Subtotals*	*9*	*0*	*5*
	Total			17	Total			17	Total			14
Sophomore	HumBio 2A	5			HumBio 3A	5			Phys 43	4		
	HumBio2B	5			HumBio 3B	5			BME Depth		3	
	ENGR 14		3		Phys 41	4			GER			4
									ME Depth		3	
	Subtotals	*10*	*3*	*0*	*Subtotals*	*14*	*0*	*0*	*Subtotals*	*4*	*6*	*4*
	Total			13	Total			14	Total			14
Junior	ENGR 15		3		ENGR 30		3		ENGR 25		3	
	ME Depth		4		ME 70		4		Language			5
	Language			5	Language			5	GER			5
	GER			4	Bio 44x	4			ME Depth		3	
	Subtotals	*0*	*7*	*9*	*Subtotals*	*4*	*7*	*5*	*Subtotals*	*0*	*6*	*10*
	Total			16	Total			16	Total			16
Senior	ME 80/81		4		ME Depth		4		Elective			4
	BME Depth		3		BME Depth		3		GER			5
	ME 389		1		GER			4	Elective			4
	TIS Course			4	Elective			4	Sci Elective	4		
	Engr. Fund.		3									
	Subtotals	*0*	*11*	*4*	*Subtotals*	*0*	*7*	*8*	*Subtotals*	*4*	*0*	*13*
	Total			15	Total			15	Total			17

Total Math & Science Units:	63
Total Engineering Units:	47
Total Other Units:	74
Total Units:	184

Notes:

* Chem 31A and 31B may be replaced with Chem31X (accelerated).
* Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Science+Engineering Design Units; see description of "Other Elective Courses" for details.
* Bio44X fulfills the "Writing in the Major" requirement.
* Students who place out of the language requirement should replace language units with technical electives.

INSTRUCTIONS FOR DECLARING MAJOR IN ENGINEERING: BIOMECHANICAL ENGINEERING (BSE-BME)

1. Print a copy of your transcript from Axess.
2. Download the BSE:BME program sheet from the School of Engineering web site (http://ughb.stanford.edu). Please make sure to include courses you plan to take as well as those you have already taken. Complete the sheet and attach a ½ page Statement of Purpose.
3. Set up a short appointment with the BME undergraduate coordinator: bme-ugradsc@lists.stanford.edu to discuss proposed courses, advisors, etc.
4. Pick up a BME major declaration form from the Student Services Office (Building 530, room 125)
5. Identify an undergraduate program advisor from the list on the back of the major declaration form. If you prefer, the Student Services Office will assign one to you.
6. Discuss the program with your BME advisor and have him/her approve and sign your program sheet and declaration form.
7. Return completed documents (including any transfer credit forms) to the Student Services Office.
8. Login to Axess and formally declare your major. **NOTE: Select "Engineering" as your major** (NOT Mechanical Engineering), **with a subplan in "Biomechanical Engineering"**.
9. E-mail Patrick Ferguson (patrickf@stanford.edu) to let him know that you have declared your major, so that he may approve it.

Please Print Neatly

Name (Last _____First _____

ID# _____ Email _____

Declaration Authorization

Assigned to: _____

Major Advisor Signature _____

Date _____

DON'T FORGET TO DECLARE IN AXESS! (see step #8) REV 08/06

Stanford University ♦ School of Engineering

Biomechanical Engineering

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

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Mathematics (21 units minimum)							
				(21 units minimum)			
Science (22 units minimum, see note 1)							
Bio	44X	Biology Labs (see note 2)	4				
Bio/HumBio		Bio Core/ HumBio A Core	5				
Bio/HumBio		Bio Core/ HumBio A Core	5				
				(22 units minimum)			
				(43 units minimum)			

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

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.
* Science: Must include Chem 31X (or Chem 31A/B) and 1 year of physics, OR 1 year of Chemistry including Chem 31X (or Chem 31A/B), and 1quarter of physics. A solid foundation in physics in strongly recommended.
* Minimum Combined Grade Point Average for all courses in Engineering Topics (Engineering Fundamentals and Depth courses) is 2.0.
* Transfer and AP credits in Math, Science, Funamentals, & 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) Must include both Chemistry and Physics with a depth in at least one, and 2 courses (10 units) of HumBio A core or Bio core.

(2) Fulfills the "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 96 or later.

program sheet continues on page 2

Biomechanical Engineering Program Sheet (page 2 of 3)

Engineering Fundamentals *(3 courses required - please choose one more)*

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
ENGR	14	Applied Mech: Statics	3				
ENGR	25	Introduction to Biotechnology	3				
			6				

Engineering Depth*: ME Core (Be advised, no course may be listed twice on this sheet. No double-counting.)*

ENGR	15	Dynamics	3				
ENGR	30	Engineering Thermodynamics	3				
ME	70	Introductory Fluids Engineering	4				
ME	80/81	Stress, Strain & Strength	4				
ME	389	Biomechanical Engineering Seminar	1				
		ME Core Units	15				
Options to complete ME depth sequence (select 3 courses, min. 9 units; delete courses not taken)							
ME	101	Visual Thinking	3				
ME	203	Manufacturing & Design	4				
ME	103D	Engineering Drawing	1				
ME	112	Mechanical Systems	4				
ME	113	Engineering Design	4				
ME	131A	Heat Transfer	4				
ME	131B	Fluid Mechanics	4				
ME	140	Integrated Thermal Systems	5				
ME	161	Dynamic Systems	4				
ENGR	105	Control Design	3				
ME	210	Introduction to Mechatronics	4				
ME	220	Introduction to Sensors	3				
		ME Depth Units	43	*(9 units minimum)*			
Options to complete BME depth sequence (select 3 courses, minimum 9 units)							
ME	280	Skeleton Development & Evolution	3				
ME	281	Biomechanics of Movement	3				
ME	294	Medical Device Design	3				
ME	284A/B	Cardiovascular Bioengineering	6				
		BME Depth Units	15	*(9 units minimum)*			
		Engineering Depth Unit Totals	73	*(33 units minimum)*			

program sheet continues on page 3

Biomechanical Engineering Program Sheet (page 3 of 3)

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Additional Courses (as needed or desired)							
Biosci	44Y	Biology Lab					
Surg	101	Introduction to Surgery					
Biosci	112	Human Physiology					
Biosci	150	Human Behavioral Biology					
HumBio	110	Vertebrate Biology					
HumBio	110L	Vertebrate Biology Labs					
Biosci	118	Genetic Analysis of Biological Processes					
Biosci	129A/B	Cellular Dynamics I & II					
Biosci	136	Evolutionary Paleobiology					
		Additional Courses Unit Totals	0				

Program Totals

Mathematics and Science	0	*(43 units minimum)*
Engineering Depth	73	*(39 units minimum)*
Total Program Units	79	*(99 units minimum)*

Program Approvals *(see note 3)*

Advisor
Printed Name: _____ Date: _____
Signature: _____

Departmental
Printed Name: _____ Date: _____
Signature: _____

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

NOTES (continued from page 1)

(3) Bring completed Program Sheet and 1/2 page Statement of Purpose to the Student Services Office, Bldg. 530, Room 125. This form must be completed and approved by the first quarter of the junior year AND revised (if necessary) by the second quarter of the senior year.