

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.

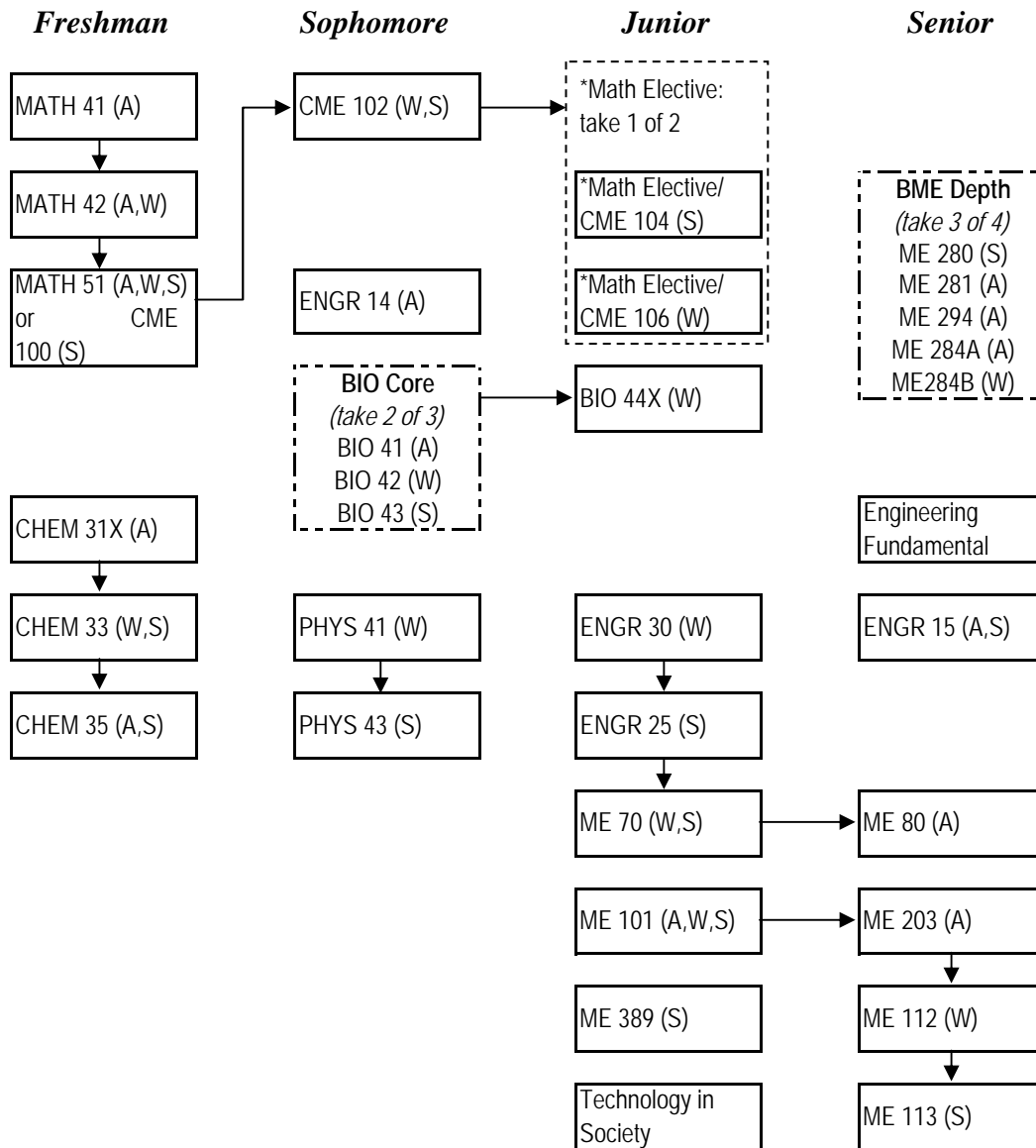
The Biomechanical Engineering major provides a fundamental understanding of mechanics in the fields of biology and medicine. However, it is not normally recommended as a terminal degree. This major is well suited for those interested in future graduate studies in bioengineering, medicine, and related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

Note: The online version of the UGHB is considered the definitive and final version of SoE requirements for each major. Since corrections or updates may have been made after this Handbook went to press in August 2008, download the online BME program sheet from ughb.stanford.edu to ensure you are using an accurate major plan

Biomechanical Engineering

Typical Sequence of Courses

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



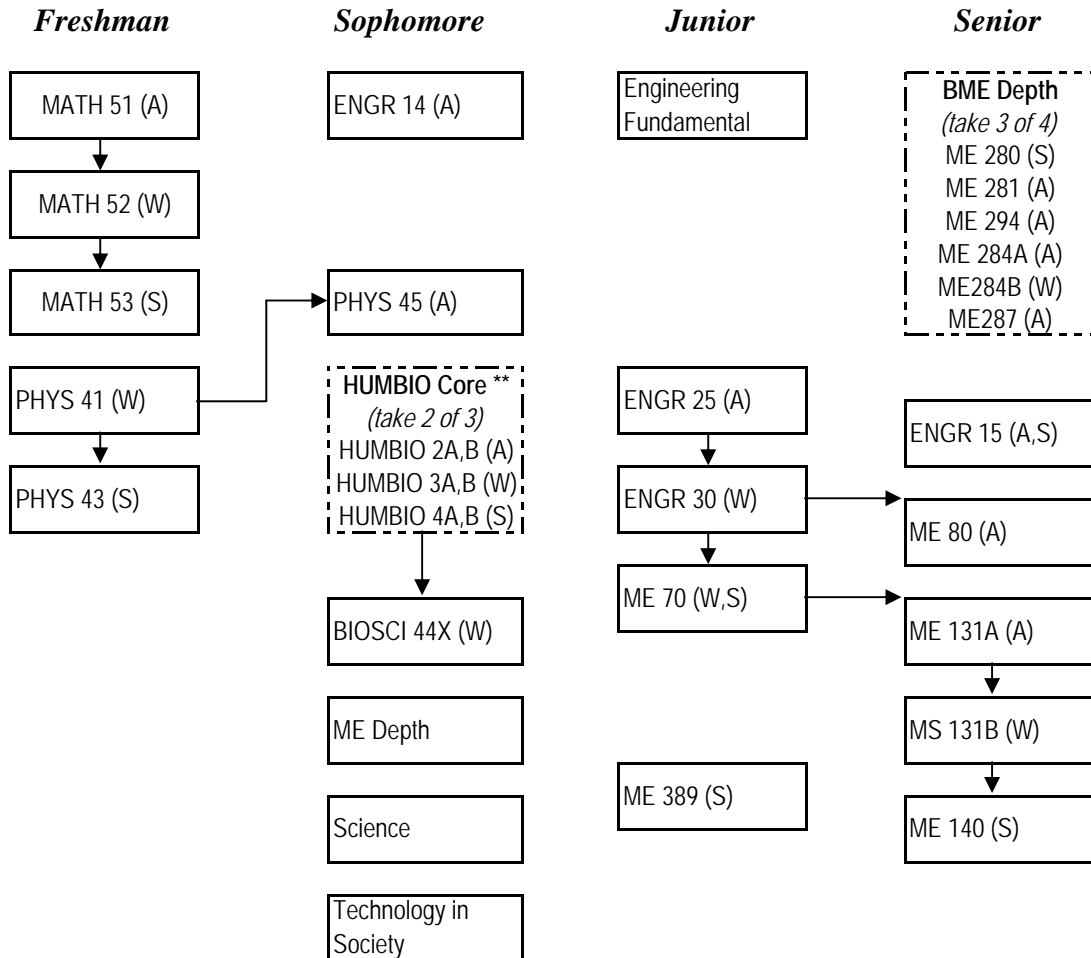
* Arrows represent direct prerequisites

* 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 take the 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

	MATH/			MATH/S			MATH/					
	Class	Sci.	Engr.	Other	Class	ci.	Engr.	Other	Class	Sci.	Engr.	Other
<i>Freshman</i>	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
	<i>Subtotals</i>	<i>9</i>	<i>0</i>		<i>8</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>8</i>	<i>Subtotals</i>	<i>4</i>	<i>0</i>
Total				17	Total			17	Total			16
<i>Sophomore</i>	BIO 41	5			BIO 42	5			BIO 43	5		
	ENGR 14		3		PHYS 41	4			ME101		3	
	CHEM 35		4		ENGR 155A	5			BME Depth		3	
	CME 100	5		3					GER			4
	<i>Subtotals</i>	<i>10</i>	<i>7</i>		<i>3</i>	<i>Subtotals</i>	<i>14</i>	<i>0</i>	<i>0</i>	<i>Subtotals</i>	<i>5</i>	<i>6</i>
Total				20	Total			14	Total			15
<i>Junior</i>	ENGR 15		3		ENGR 30		3		ENGR 25		3	
	ME 203		4		ME 70		4		Language			5
	ME 103D		1		BIO 44x	4			GER			5
	Language			5	Language			5	GER			5
	GER			4								
<i>Subtotals</i>	<i>0</i>	<i>8</i>		<i>9</i>	<i>Subtotals</i>	<i>4</i>	<i>7</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>3</i>	<i>15</i>
Total				17	Total			16	Total			18
<i>Senior</i>	ME 80		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				
	<i>Subtotals</i>	<i>0</i>	<i>8</i>		<i>4</i>	<i>Subtotals</i>	<i>0</i>	<i>7</i>	<i>8</i>	<i>Subtotals</i>	<i>0</i>	<i>0</i>
Total				12	Total			15	Total			13

Total MATH & Science Units: 55

Total Engineering Units: 46

Total Other Units: 89

Total Units: 190

Notes:

* BIO44X fulfills the "Writing in the Major" requirement.

* CHEM 31A/B may be replaced with 31X (accelerated). CHEM 31A is not considered a stand alone course.

* Students who place out of the language requirement should replace language units with technical electives.

Biomechanical Engineering

4 Year Plan: Starting with MATH 40 series, with Physics

	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>								
	MATH/ Class Sci. Engr. Other	MATH/ Class Sci. Engr. Other	MATH/S Class ci. Engr. Other								
<i>Freshman</i>	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					
	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>8</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>5</i>
Total	17			Total	17			Total	14		
<i>Sophomore</i>	BIO 41	5			BIO 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	
	<i>Subtotals</i>	<i>14</i>	<i>3</i>	<i>0</i>	<i>Subtotals</i>	<i>14</i>	<i>3</i>	<i>Subtotals</i>	<i>4</i>	<i>6</i>	<i>4</i>
Total	17			Total	17			Total	14		
<i>Junior</i>	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
	<i>Subtotals</i>	<i>0</i>	<i>7</i>	<i>9</i>	<i>Subtotals</i>	<i>4</i>	<i>7</i>	<i>Subtotals</i>	<i>0</i>	<i>6</i>	<i>10</i>
Total	16			Total	16			Total	16		
<i>Senior</i>	ME 80		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									
<i>Subtotals</i>	<i>4</i>	<i>8</i>	<i>4</i>	<i>Subtotals</i>	<i>0</i>	<i>7</i>	<i>Subtotals</i>	<i>0</i>	<i>0</i>	<i>13</i>	
Total	16			Total	15			Total	13		

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

Notes:

- * BIO44X fulfills the "Writing in the Major" requirement.
- * Students who place out of the language requirement should replace language with technical electives.
- * CHEM 31A/B may be replaced with 31X (accelerated). CHEM 31A is not considered a stand alone course.

Biomechanical Engineering

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

	<i>Fall</i>			<i>Winter</i>			<i>Spring</i>			
	MATH			MAT			MAT			
	/Sci.	Engr.	Other	Class	H/Sci.	Engr.	Class	H/Sci.	Engr. Other	
<i>Freshman</i>	Writing			Writing			IHUM		5	
	IHUM			IHUM			CHEM 33	4		
	CME 100		5	CHEM 31B*	4		CME 104		5	
	CHEM 31A*	4		CME 102		5				
	<i>Subtotals</i>	4	5	8	<i>Subtotals</i>	4	5	<i>Subtotals</i>	4	5
Total			17	Total			Total		14	
<i>Sophomore</i>	BIO 41	5		BIO 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	
	<i>Subtotals</i>	9	3	0	<i>Subtotals</i>	13	3	<i>Subtotals</i>	4	6
Total			12	Total			Total		14	
<i>Junior</i>	ENGR 15		3	ENGR 30		3	ENGR 25		3	
	ME Depth		4	ME 70		4	Language		5	
	Language			Language		5	GER		5	
	GER		4				ME Depth		3	
	<i>Subtotals</i>	0	7	9	<i>Subtotals</i>	0	7	<i>Subtotals</i>	0	6
Total			16	Total			Total		16	
<i>Senior</i>	ME 80		4	ME Depth		4	Elective		4	
	BME Depth		3	BME Depth		3	GER		5	
	ME 389		1	GER		4	Elective		4	
	TIS Course			Elective		4				
	Sci Elective	4								
<i>Subtotals</i>	4	8	4	<i>Subtotals</i>	0	7	<i>Subtotals</i>	0	0	13
Total			16	Total			Total		13	

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

Notes:

- * Students who place out of the language requirement should replace language units with technical electives
- * CHEM 31A/B may be replaced with 31X (accelerated). CHEM 31A is not considered a stand alone course.
- * BIO44X fulfills the "Writing in the Major" requirement.

Biomechanical Engineering

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

	<i>Fall</i>			<i>Winter</i>			<i>Spring</i>					
	MAT			MAT			MAT					
	Class	H/Sci.	Engr.	Other	Class	H/Sci.	Engr.	Other	Class	H/Sci.	Engr.	Other
<i>Freshman</i>	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						
	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>8</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>8</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>5</i>
Total				17	Total				17			14
<i>Sophomore</i>	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	
	<i>Subtotals</i>	<i>10</i>	<i>3</i>	<i>0</i>	<i>Subtotals</i>	<i>14</i>	<i>0</i>	<i>0</i>	<i>Subtotals</i>	<i>4</i>	<i>6</i>	<i>4</i>
Total				13	Total				14			14
<i>Junior</i>	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	
	<i>Subtotals</i>	<i>0</i>	<i>7</i>	<i>9</i>	<i>Subtotals</i>	<i>4</i>	<i>7</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>6</i>	<i>10</i>
Total				16	Total				16			16
<i>Senior</i>	ME 80		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									
<i>Subtotals</i>	<i>0</i>	<i>11</i>	<i>4</i>	<i>Subtotals</i>	<i>0</i>	<i>7</i>	<i>8</i>	<i>Subtotals</i>	<i>4</i>	<i>0</i>	<i>13</i>	
Total				15	Total				15			17

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

Notes:

- * CHEM 31A/B may be replaced with 31X (accelerated). CHEM 31A is not considered a stand alone course.
- * BIO 44X fulfills the "Writing in the Major" requirement
- * Students who place out of the language requirement should replace language with technical electives.

INSTRUCTIONS FOR DECLARING MAJOR IN ENGINEERING: BIOMECHANICAL ENGINEERING (BS-ENGR)

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 Christine Crapps (crapps@stanford.edu) and ask her to approve your declaration

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)

Stanford University ♦ School of Engineering
Biomechanical Engineering
2008–2009 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.

Follow all requirements as stated for the year of the program sheet used.

Name: _____ SU ID: _____
 Email: _____ Local Phone: _____
 Date: _____ Date B.S. expected: _____

Mathematics and Science Requirements

Dept	Course	Title	Transfer/AP Approval			Unit	Grade
			✓ if Transfer	Initials	Date		
<i>Mathematics (21 units minimum)</i>							
						<i>(21 units minimum)</i>	

Science (22 units minimum, see note 1)

BIO	44X	Biology Labs (WIM; see note 2)				4	
Bio/HumBio		Bio Core/ HumBio A/B Core				5	
Bio/HumBio		Bio Core/ HumBio A/B Core				5	
Chem	31X	Chemical Principals (see note 3)				4	
						<i>(22 units minimum)</i>	
						<i>(43 units minimum)</i>	

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

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

Dept	Course	Title	Transfer/AP Approval			Units	Grade
			✓ if Transfer	Initials	Date		
ENGR	14	Applied Mechanics: Statics				3	
ENGR	25	Biotechnology				3	
		Fundamental Elective					

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.
- * Read all emails from the Office of Student Affairs; this is the SoE's only method of conveying key information to Engr majors.
- * All courses listed on this form must be taken for a letter grade if offered by the instructor.
- * 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) Must include both Chemistry and Physics with a depth (three quarters) in at least one, 2 quarters of HumBio A/B core or Bio core, and Chem31X (see note 3). Please note that a depth in chemistry can be fulfilled with Chem31A,
- (2) Fulfills the "Writing in the Major" requirement. Bio44X can be replaced with Bio54
- (3) Chem31X can be replaced with ENGR 31, or with two-quarter sequence Chem31A and Chem31B

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

Dept	Course	Title	Transfer/AP Approval		Units	Grade
			Initials	Date		
ENGR	15	Dynamics			3	
ENGR	30	Engineering Thermodynamics			3	
ME	70	Introductory Fluids Engineering			4	
ME	80	Strength of Materials			4	
ME	389	BioEngineering & BioDesign Forum			1	

ME Core Units

Options to complete ME depth sequence (select 3 courses, min. 9 units; see note 4)

ME Depth Units (9 units minimum)

Options to complete BME depth sequence (select 3 courses, minimum 9 units; see note 5)

BME Depth Units (9 units minimum)

Engineering Depth Unit Totals (33 units minimum)

Additional Courses (as needed to bring unit total to 99)

BIO	44Y	Biology Lab				
Surg	101	Introduction to Surgery				
BIO	112	Human Physiology				
HumBio	160	Human Behavioral Biology				
BIO	118	Genetic Analysis of Biological Processes				
BIO	129A/B	Cellular Dynamics I & II				
BIO	136	Evolutionary Paleobiology				

BME Elective Units (as needed)

Program Totals

Mathematics and Science (43 units minimum)

Engineering & Fundamentals Depth (42 units minimum)

TIS Course + Depth Electives

Total Program Units (99 units minimum)

Program Approvals (see note 6)

Advisor

Printed Name: _____

Date: _____

Signature: _____

Departmental

Printed Name: _____

Date: _____

Signature: _____

School of Engineering (signature not required prior to graduation)

Printed Name: _____

Date: _____

Signature: _____

NOTES (continued from page 1)

- * Minimum combined grade point average for all courses in Engineering Topics (Engr Funds & Depth) is 2.0
- (4) Choose three courses from ME 101, 103D, 105, 112, 113, 131A, 131B, 140, 161, 203, 210, 220
- (5) Choose three courses from ME 280, 281, 287, 284A, 284B, 294
- (6) 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.