

**Accelerated Master's Degree in Biomanufacturing**  
**(BS CHE Biomanufacturing Concentration/MR BIOM)<sup>4,5</sup>**

<b>Fall Semester</b>	<b>Credit</b>	<b>Spring Semester</b>	<b>Credit</b>
CH 101 (or 103) General Chem I <sup>1a</sup>	3	CH 201 (or 203) General Chem II <sup>1b</sup>	3
CH 102 (or 104) Gen Chem I Lab <sup>1a</sup>	1	CH 202 (or 204) General Chem II Lab	1
E 101 Intro to Engr & Prob Solv <sup>1a</sup>	1	MA 241 Calculus II <sup>1a</sup>	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I <sup>1a</sup>	3
ENG 101 Academic Writ & Res <sup>1a</sup>	4	PY 206 Physics for Engr & Sc I Lab <sup>1a</sup>	1
MA 141 Calculus I <sup>1a</sup>	4	E102 Engr in the 21 <sup>st</sup> Century (GEP IP)	2
HESx 1** Fitness & Wellness*	<u>1</u>	HESx (100 or 200 level) Elective*	<u>1</u>
	<b>15</b>		<b>15</b>

<b>Fall Semester</b>	<b>Credit</b>	<b>Spring Semester</b>	<b>Credit</b>
BEC 220 Intro Biomanufacturing	1	BIO 183 Intro Bio: Cell & Molecular	4
CH 221 (or 225) Organic Chem I <sup>1b</sup>	3	CH 223 (or 227) Organic Chem II	3
CH 222 (or 226) Org Chem I Lab	1	CH 224 (or 228) Organic Chem II Lab	1
CHE 205 Chemical Proc Prin <sup>1b</sup>	4	CHE 225 Chemical Proc Systems <sup>1b</sup>	3
MA 242 Calculus III <sup>1b</sup>	4	MA 341 Applied Differential Eq <sup>1b</sup>	3
PY 208 Physics Engr & Sc II	3	EC 205 Econ (or EC 201/ARE 201)*	<u>3</u>
PY 209 Physics Engr & Sc II Lab	<u>1</u>		<b>17</b>
	<b>17</b>		

<b>Fall Semester</b>	<b>Credit</b>	<b>Spring Semester</b>	<b>Credit</b>
BCH 451 Intro Biochemistry	4	BEC 426 Ind Micro & Bioman Lab	2
BEC 425 Molecular Bio Biomanf	2	BEC 330 Prin & Applications of Biosep	2
BEC 463 Ferm of Recomb Micro	2	CHE 312 Transport Processes II	3
CHE 311 Transport Processes I <sup>1</sup>	3	CHE 316 Thermo of Chem & Phase Eq	3
CHE 315 Chem Process Thermo <sup>1</sup>	3	Free Elective	3
GEP Requirement*	<u>3</u>	GEP Requirement*	<u>3</u>
	<b>17</b>		<b>16</b>

<b>Fall Semester</b>	<b>Credit</b>	<b>Spring Semester</b>	<b>Credit</b>
BEC 536 Intro. to Downstream Process Development <sup>2</sup>	2	CHE/BEC 548 Bioreactors <sup>2</sup>	2
BEC 580 Large Scale Fermentation <sup>2</sup>		CHE 552 Biomolecular Engineering <sup>2</sup>	2
<b>OR</b>		CHE 435 Proc System Analy & Control	3
BEC 585 Large Scale Recov & Purif		CHE 451 CHE Design II	3
CHE 395 Professional Dev Seminar	2	GEP Requirement*	3
CHE 446 Des & Analy Chem React	1	BEC 620 Prep. For Industry Internship <sup>5</sup>	<u>2</u>
CHE 450 CHE Design I	3		<b>15</b>
Bioethics Course (GEP IP Req*) <sup>3</sup>	3		
GEP Requirement*	3		
	<u>3</u>		
	<b>17</b>		

Fall Semester	Credit	Spring Semester	Credit
BEC 590 Industry Practicum	3	BEC 575 Global Regulatory Affairs	3
BEC 580 Large Scale Fermentation <b>OR</b> BEC 585 Large Scale Recov & Purif	2	BEC/CHE 577 Adv. Biomanufacturing & Biocatalysis	3
BEC 545 Mammalian Cell Line Development	2	BEC/CHE 588 Cell Culture Engineering	<u>3</u>
BEC 515 Biopharmaceutical Product Characterization	2	ST 516 Statistics for Engineers II	<b>11</b>
ST 515 Statistics for Engineers I	<u>3</u>		
	<b>12</b>		

Minimum Credit Hours Required for Graduation: **152**

**Major/Program requirements and footnotes:**

<sup>1a</sup> Must be completed with grade of (C) or higher.

<sup>1b</sup> Must be completed with grade of (C-) or higher.

<sup>2</sup>BEC courses that must be taken for graduate credit: BEC 536, BEC 548, BEC 552, BEC 580 **OR** BEC 585, BEC 575

<sup>3</sup>The bioethics course must be selected from: IDS 201, 303; STS 302, 304; STS(PHI) 325

<sup>4</sup> Students must have a minimum overall GPA of 3.5 through the end of the junior year and must maintain this GPA through the senior year to be admitted into the program. Students who wish to complete the Accelerated BS/MS CHE BIOM degree program must apply for candidacy to the MS degree during the fall semester of the senior year. The admissions process includes submitting the following information to the Biomanufacturing Graduate Administrator, Dr. Danny Monroe:

- (1) Completed copy of the signed graduate application form
- (2) NC Residency Form if you wish to claim NC residency for tuition purposes
- (3) Non-Refundable application fee in form of a check or money order
- (4) Three letters of recommendation and a personal statement outlining your career goals
- (5) Official transcript sent directly from every college and graduate school attended
- (6) Graduate Record Examination (**GRE**) scores

Students must receive a grade of B (3.0/4.0) or better in the double counted graduate level BEC or CHE courses. Courses with a grade of B- or below cannot be double counted between the two degrees. No more than twelve (12) hours of graduate work may be counted towards the requirements of both degrees. Students must complete the Master's degree within 12 months from the completion of the baccalaureate degree. If the Master's program is not completed within these time limits, none of the courses can be double counted. Note that the BS Degree must be completed in order to get the dual BS/MS (students cannot double major in something else and then skip to the MS CHE). Recipients of the MS BIOM degree must earn a minimum semester GPA of 3.0 during the final two semesters, including no more than one C grade in a 5xx level CHE or BEC course.