



Course information for

DEPARTMENT OF  
MICROBIOLOGYBiomanufacturing Training  
and Education Center**Fundamentals of Microbial Cell Biotransformations**[Syllabus-FMCB.pdf](#)

<b>Course #</b>	<b>MB(BEC) 420</b>	
<b>Instructors</b>	José Manuel Bruno-Bárcena 1552A Gardner Hall Addition North Carolina State University Raleigh, NC 27695	Phone: 919-513-1495 Fax: 919-515-7867 email: jbbarcen@ncsu.edu Web Site: <a href="http://www4.ncsu.edu/~jbbarcen">http://www4.ncsu.edu/~jbbarcen</a>
	Matthew Evans 850 Oval Drive, Suite 195 Raleigh, NC 27695-7928	Phone: 919-513-8094 Fax: 919-513-8235 email: mrevans@ncsu.edu
<b>Prerequisites</b>	BEC(MB) 320, or MB 352	
<b>Credit Hours</b>	2	
<b>Restrictions</b>	Students who have completed BIT (CHE) 463 may not take this course for credit. Electronic devices are required to be turned off in the classroom	
<b>LOCATION</b>	Golden LEAF BTEC Building rooms #123 and #110. Centennial Campus <a href="#">OBTAIN DIRECTIONS HERE</a>	
<b>Date</b>	From October 14 <sup>th</sup> to December 4 <sup>th</sup>	
<b>Class Hours</b>	Lecture - Tuesdays, 12:50-14:40; Laboratory - Time 520 PM- 10:15 PM <ul style="list-style-type: none"> <li>• Wednesdays, Section MB 420L 205 &amp; BEC 420L 202 Time 1250 PM- 550 PM</li> <li>• Thursdays, Section MB 420L 206 &amp; BEC 420L 201 Room #110 Small scale Fermentation Lab BTEC Building</li> </ul>	
<b>Office Hours</b>	Tuesday, 14:50-15:30	
<b>Course Website</b>	<a href="http://vista.ncsu.edu/">http://vista.ncsu.edu/</a>	
<b>Delivery Format</b>	This is a half-semester class. Students are required to attend weekly lectures and laboratories during the weeks the course is taught.	
<b>Course Description</b>	Basic microbial cell culture theory and practice: cell physiology, mass balances, and metabolic control as seen in a dynamic bioreactor culture. The biological understanding, mathematical models, and engineering controls that enable a bioreactor process to be scalable, consistent, and robust. The lab portion of the course provides students with hands-on experience in culture techniques using bioreactors.	
<b>Technology Requirements</b>	In order to complete the course, all students will be required to have access to an active internet connection. If you do not have Adobe Acrobat Reader installed on your computer, you will need to go to the following web site and follow the instructions to download a free version. <a href="http://www.adobe.com/products/acrobat/readstep2.html">http://www.adobe.com/products/acrobat/readstep2.html</a>	
<b>Text Requirements</b>	All required reading material is contained within the course or is available through a World Wide Web link provided within the course content. At present, all laboratory reading materials will be provided. The class links page is also available as a source of the following references for the course:  1. Shuler, M.L., Kargi, F., editors 2002. Bioprocess Engineering: Basic Concepts. Prentice-Hall of India (ISBN0130819085) \$127.00 This reference will also be available in the Reserve Room of the D. H. Hill .Library.	
<b>Learning Outcomes</b>	At the end of this course, you should be able to: <ul style="list-style-type: none"> <li>❖ explain key fundamental biotechnology concepts and will be able to understand and comprehend culturing processes used in the traditional and in the modern biotechnology;</li> <li>❖ demonstrate laboratory and cell culture techniques using small scale bioreactors</li> </ul>	

	<p>while observing standard safety practices; and</p> <ul style="list-style-type: none"> <li>❖ determine and analyze results of laboratory experiments as well as be aware of the importance of the interdisciplinary effort required for product development.</li> </ul>																																							
<b>Lecture Outlines by Topical Areas</b>	<ol style="list-style-type: none"> <li>1. History of traditional and modern biotechnology. Pure culture philosophy</li> <li>2. Cell Nutrition</li> <li>3. Elemental composition and stoichiometry of cells</li> <li>4. Microbial growth and production rate</li> <li>5. Microbial cell culture and selecting the cultivation system</li> <li>6. Microbial physiology and metabolic control: Adaptability of cells</li> <li>7. Introduction to process instrumentation, monitoring and supervision</li> <li>8. An overview of cGMP requirements</li> </ol>																																							
<b>Laboratory Topical Areas</b>	<ol style="list-style-type: none"> <li>1. Lab safety (equipment &amp; policies). A review of the aseptic and analytical techniques</li> <li>2. Continuous reactor cultures. Sampling and storage.</li> <li>3. Transitory pulse feed. Glucose repression or Crabtree effect</li> <li>4. Setting dilution rate. Substrate, product, and biomass analysis</li> <li>5. Calculation of maximum specific growth rate by the wash-out and by unrestricted growth methods. Distribute the stored data of the process from the computer.</li> <li>6. TFF cell harvest and UF/DF step</li> <li>7. Reactor cleaning, Reactor and probe preparation and Control unit set-up for operation</li> </ol> <p>Before the Final Test you should make available the complete notebook rendering data analysis, graphs and conclusions.</p>																																							
<b>Course Grading</b>	<ul style="list-style-type: none"> <li>• Weekly Lab quizzes (10 questions/15 minutes) and Lab reports (35%)</li> <li>• Skills demonstration and Notebook organization (Lab notebook is due on the last day of class (25%))</li> <li>• Final Test (40%)</li> </ul> <p>Students taking the course on a non-credit basis will be required to read each lesson and complete the quizzes plus the exams.</p> <p>Students taking the course on a credit-only basis will be required to read each lesson and complete the quizzes plus the exams, and to earn a CR grade, the overall score must be at least 69.0.</p>																																							
<b>Grading Scale</b>	<table border="0"> <tr><td>A+</td><td>=</td><td>97.0-100%</td></tr> <tr><td>A</td><td>=</td><td>92.0-96.9%</td></tr> <tr><td>A-</td><td>=</td><td>89.0-91.9%</td></tr> <tr><td>B+</td><td>=</td><td>86.0-88.9%</td></tr> <tr><td>B</td><td>=</td><td>82.0-85.9%</td></tr> <tr><td>B-</td><td>=</td><td>79.0-81.9 %</td></tr> <tr><td>C+</td><td>=</td><td>76.0-78.9%</td></tr> <tr><td>C</td><td>=</td><td>72.0-75.9%</td></tr> <tr><td>C-</td><td>=</td><td>69.0-71.9%</td></tr> <tr><td>D+</td><td>=</td><td>66.0-68.9%</td></tr> <tr><td>D</td><td>=</td><td>62.0-65.9%</td></tr> <tr><td>D-</td><td>=</td><td>59.0-61.9%</td></tr> <tr><td>F</td><td>=</td><td>&lt; 59.0%</td></tr> </table> 	A+	=	97.0-100%	A	=	92.0-96.9%	A-	=	89.0-91.9%	B+	=	86.0-88.9%	B	=	82.0-85.9%	B-	=	79.0-81.9 %	C+	=	76.0-78.9%	C	=	72.0-75.9%	C-	=	69.0-71.9%	D+	=	66.0-68.9%	D	=	62.0-65.9%	D-	=	59.0-61.9%	F	=	< 59.0%
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<b>Policy on Late Assignments and Incomplete Grades</b>	<p>Assignments are due on or before the time and date indicated on the assignments. Due dates can be extended for students with valid reasons as defined by the NCSU Attendance policy at: <a href="http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.3.php">www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.3.php</a>. In cases where the conflict can be anticipated, prior arrangements must be made with the instructor to receive an extension. In cases of illness or family emergency, the student may be required to present documentation or other proof to receive an extension. Late assignments without a valid excuse will not be accepted and will receive a score of zero. The university policy regarding incomplete grades (IN) applies to this course. See <a href="http://ncsu.edu/policies/academic_affairs/grades_undergrad/REG02.50.3.php">http://ncsu.edu/policies/academic_affairs/grades_undergrad/REG02.50.3.php</a> for instructor's</p>																																							

	policy on IN grades.
<b>Academic Integrity Statement</b>	It is expected that each student will complete his/her own homework, quizzes, and exams with academic integrity. Students shall follow the <a href="http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php">NCSU Code of Student Conduct (http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php)</a> In addition, your signature on any test or assignment means that you neither gave nor received unauthorized aid. In other words, your signature on to-be-graded work in this course communicates an understanding of, and adherence to, the University Honor Pledge: "I have neither given nor received unauthorized aid on this test or assignment"
<b>Attendance Policy</b>	Students are expected to attend class and attendance will be taken. If there is a need to miss class, notify the instructor prior to the class. It is the student's responsibility to obtain assignments and information for any missed classes. For NCSU attendance regulations, refer to the academic policy and regulations website at: <a href="http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.3.php">http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.3.php</a>  Attendance at <b>ALL</b> laboratories is mandatory and unexcused absence from lab will result in failure of the course. Lecture attendance is also required and non-attendance will result in a reduction of 10 points in the final grade.
<b>Laboratory Safety</b>	Each student is expected to observe proper laboratory procedures as outlined in the class instructions for each laboratory period and in the Lab Safety Plan to be presented at the first laboratory meeting.
<b>Students with Disability Policy</b>	Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. <a href="http://www.ncsu.edu/dso/">http://www.ncsu.edu/dso/</a>  Students with disabilities should contact the instructor for any additional assistance. Federal law mandates that the faculty provide reasonable accommodations to students with disabilities. (See <a href="#">NC State's Academic Regulation for providing accommodations for students with disabilities.</a> ) ( <a href="http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.1.php">http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.1.php</a> )

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