UNIVERSITY FACULTY SENATE FORMS
Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. For more information, call the Faculty Senate Office at 831-2921.

Submitted by: Melinda K. Duncan phone number 0533

Action: Request for New Graduate Degree "Certificate in Biotechnology"
(Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

Effective term 010J
(use format 04F, 05W)

Current degree_____
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed change leads to the degrees of: Certificate
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed names: Graduate Certificate in Biotechnology
Proposed new name for revised or new major / minor / concentration / academic unit (if applicable)

Revising or Deleting:

Undergraduate major / Concentration:_____
(Example: Applied Music – Instrumental degree BMAS)

Undergraduate minor:_____
(Example: African Studies, Business Administration, English, Leadership, etc.)

Graduate Program Policy statement change: _____
(Attach your Graduate Program Policy Statement)

Graduate Program of Study:_____
(Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)

Graduate minor / concentration:_____

List program changes for curriculum revisions:
None

List new courses required for the new or revised curriculum:
MAST697, MAST698; however, if these courses are not approved, they are not critical for the certificate to run.

Other affected units:
ANFS, PLSC, MAST, CHEM, HESC, ENWC, CISC, CHEG, CPEG, ELEG, MEEG, NURS, PHYT, STAT. The chairs of all affected units have been contacted and given approval.

Rationale:
(Explain your reasons for creating, revising, or deleting the curriculum or program.)
This certificate is designed to complement the Professional Science Master's (PSM) in Biotechnology and overlaps with a significant portion of the science core of the PSM. It is intended to serve as a stepping stone to earning the PSM for part-time students. However, the target audience for this certificate is expected to be diverse and will include both full-time students in existing UD graduate programs and part-time students who currently hold full-time employment in the field.

Program Requirements:
(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the present curriculum.)

See Attached.

ROUTING AND AUTHORIZATION: (Please do not remove supporting documentation.)

Department Chairperson _____ Date _____

Dean of College _____ Date _____

Chairperson, College Curriculum Committee _____ Date _____

Chairperson, Senate Com. on UG or GR Studies _____ Date _____

Chairperson, Senate Coordinating Com. _____ Date _____

Secretary, Faculty Senate _____ Date _____

Date of Senate Resolution _____ Date to be Effective _____

Registrar _____ Program Code _____ Date _____

Vice Provost for Academic Programs & Planning _____ Date _____

Provost _____ Date _____

Board of Trustee Notification _____ Date _____

Resolution for the Faculty Senate Agenda (if a resolution is required)

WHEREAS, the proposed Graduate Certificate in Biotechnology is an interdisciplinary graduate course of study covering the scientific underpinnings of the biotechnology revolution and

WHEREAS, there has been much interest over several years from individuals with diverse backgrounds and interest in pursuing advanced graduate studies in biotechnology, and

WHEREAS, the experience of the Department of Biological Sciences with graduate level training in the life sciences in collaboration with Departments ranging over the Colleges of Arts and Sciences, Agriculture and Natural Resources, Earth, Ocean and Environment, Engineering, and Health Sciences provide existing courses and a foundation for the program, and

WHEREAS, the proposed program contributes to three milestones on the University's "path to prominence": to become a premier research and graduate university; to achieve excellence in professional education; and the engaged university, be it therefore

RESOLVED, that the Faculty Senate recommends approval provisionally, for five years, the establishment of a new major leading to the Certificate in Biotechnology, effective June 1, 2010.

Graduate program proposal

Graduate Certificate in Biotechnology

I. *DESCRIPTION*

This certificate is designed to complement the Professional Science Master's (PSM) in Biotechnology and overlaps with a significant portion of the science core of the PSM. It is intended to serve as a stepping stone to earning the PSM for part-time students. However, the target audience for this certificate is expected to be diverse and will include both full-time students in existing UD graduate programs and part-time students who currently hold full-time employment in the field.

II. *RATIONALE AND DEMAND*

A. Institutional factors.

1. In May of 2008, the University of Delaware unveiled its "Path to Prominence" strategic plan. Objective III of the strategic plan it to achieve "Excellence in Professional Education" to meet the needs of a world where a bachelor's degree is no longer enough. In fall 2009, President Harker has highlighted the Professional Science Master's (PSM) initiative as important progress towards the Excellence in Professional Education objective during town hall meetings with UD faculty (see Powerpoint presentation at http://www.udel.edu/udaily/2010/sep/townhalls091509.html. This certificate program seeks to complement the PSM in Biotechnology and will provide workers in Delaware biotechnology

industries with advanced coursework in their disciplines.

2. The planning process began in late fall of 2008 in consultation between the Graduate Program Director of Biological Sciences, Melinda K. Duncan Ph.D., members of the Delaware Bioscience Industry Association and John Sawyer Ph.D., current Associate Provost for Professional Education, UD about the need to professional training opportunities in biotechnology at the post-bachelors level in the State of Delaware. Drs. Duncan and Sawyer applied for and were awarded a program development grant from the Delaware Valley Innovation Network in March of 2009. Since then, the curriculum has been designed in consultation with an industrial advisory board comprised of managers based in Delaware biotechnology industries, onsite discussions with mid-level managers at local biotechnology companies, the faculty of the Department of Biological Sciences, the chairs of the Departments of Computer Science and Chemistry as well as the Dean's and the chairs of affected Departments from the Colleges of Health Sciences, Agriculture and Natural Resources, Arts and Sciences, Engineering, and Earth, Oceans and Environment.
3. The impact of this program on University programs will be to increase the enrollment in graduate courses in biotechnology related fields. Commitments have been obtained from all affected units to provide this.
4. The proposed curricula would more fully utilize existing resources since it will provide enrollment for some currently undersubscribed courses in the life sciences, particularly those taught outside of the College of Arts and Sciences.

B. Student demand

1. This certificate will provide training in the life sciences for current UD graduate students enrolled in diverse graduate programs and will also be a stepping stone for part-time students working in Biotechnology related industries to the PSM in Biotechnology. While the current projection is for 10 students per year to earn this certificate, the recent workforce analyses conducted by the Delaware Valley Innovation network suggest that the demand for this program could grow much larger once the program is established (see http://www.delawarevalleyinnovationnetwork.com/reports/gap-analysis)
2. This curriculum is also intended to meet the needs of full-time UD graduate students who desire training supplementary to that of their current graduate program to prepare them for careers in biotechnology industry. However, efforts are ongoing to move a significant proportion of the content to evening or online offerings to better meet the needs of working professionals.

C. Certificate option combined with other programs.
We expect few to no students to transfer into the Certificate from other UD degree programs, although we do expect students in other graduate programs, particularly those in agriculture, chemistry, physics, mathematics and engineering to pursue this certificate if it fits their academic aspirations. Students who choose to complete the requirements for the Certificate in Biotechnology may do so if concurrently enrolled in another degree program. Courses used toward the requirements of the degree program may also be used to satisfy the requirements as appropriate for the Certificate in Biotechnology. Students who enroll in the Certificate program after the completion of a previous degree will not be permitted to transfer course(s) from the degree program to the Certificate program.

D. Access to graduate and professional programs
N/A

E. Demand and employment factors
This certificate seeks to prepare students for employment in the Biotechnology industry. The Delaware Valley Innovation Network Talent Gap Analysis for Delaware Valley Biotechnology industry (published Winter 2009, see http://www.delawarevalleyinnovationnetwork.com/reports/gap-analysis) has identified a need to increase the number of qualified biotechnology workers able to fill jobs in the growing biotechnology sector. Since full-time workers may find it challenging or impossible to simultaneously work and pursue the PSM in Biotechnology, this certificate allows these workers to expand their credentials without committing to the PSM. Further, graduate students in many MS and Ph.D. programs across the university are investigating research

problems in the life sciences, but their graduate curriculum may have little course work directly addressing problems in the life sciences. The Certificate in Biotechnology will provide interested students with training to complement their research.

F. Regional, state, and national factors

1. There are currently no comparable courses of study offered by any university in The State of Delaware. Both the Department of Biological Sciences, University of Delaware and Department of Biological Sciences/Biotechnology, Delaware State University, offer MS degrees in Biological Sciences. However, neither university offers graduate certificates in biotechnology.

2. There is no existing accrediting body for this type of program beyond the university level accreditation of Middle States.

G. Describe other strengths

The University of Delaware is uniquely positioned to offer the Certificate in Biotechnology. Our focus reflects the academic strengths of our Faculty, our longstanding and ongoing commitment to biological sciences and biotechnology industry, our existing and developing partnerships, and the unique characteristics of the region. Some of these strengths are listed below:

1. Strong research capabilities in Biotechnology and Bioinformatics at bio-related research centers at the University of Delaware such as the ***Center for Translational Cancer Research***, the ***Avian Biosciences Center*** and the ***Center for Biomedical Engineering Research.***
2. ***Delaware Biotechnology Institute***: Established in 1999 to promote research, education, and technology transfer for biotechnology applications to the benefit of the environment, agriculture, and human health.
3. ***Delaware Health Sciences Alliance***: Partnership between the *University of Delaware*, *Thomas Jefferson University*, *Christiana Care Health Systems*, and *The Nemours Foundation/Alfred I. DuPont Hospital for Children*, to support joint and collaborative education, research, public outreach, and student internships.
4. The Delaware Valley region is a major center of biosciences industry.
5. 11.5% of new jobs in the Delaware Valley region are in the biosciences.
6. Every new biosciences job in the region supports 3.7 additional jobs.
7. Longstanding relationships with key bio industry companies such as ***AstraZeneca*** and ***DuPont***.
8. Melinda Duncan and John Sawyer obtained a Department of Labor grant through the Delaware Valley Innovation Network to develop this program.

III. *ENROLLMENT, ADMISSIONS AND FINANCIAL AID*

A. The current enrollment goal is to admit 10 students per year into the program with a total of 20 students enrolled at any one time. This limit is based on the availability of seats in the graduate level classes and faculty/staff time available to provide appropriate academic advisement. If the program is successful and proves very popular in the future, it would be possible to admit additional students, although additional faculty teaching and faculty/staff administrative resources would need to be identified to do so.

B. Admission Requirements

1. Applicants will be selected based on undergraduate and any graduate transcripts, letters of recommendation, strength of prior experience in the field, the GRE and the TOEFL if applicable. See graduate program policy for details.

C. Student Expenses and Financial Aid

1. The majority of student financial support for this program is provided from the student's resources supplemented through traditional financial aid mechanisms. However, full-time graduate students on full contracts from other units will be encouraged to pursue the certificate as well.

D. Institutional Factors

Students completing this program will receive the designation "Graduate Certificate" on their transcript. This is the appropriate form of recognition since it is a course work only program of 15 credits of graduate courses.

E. Describe the curriculum

The Certificate in Biotechnology requires 15 credits of graduate level course work consisting of:

1) 9 credits of graduate level course work in the biological sciences comprised of at least one course in each of two of the five following areas: Molecular Biology, Genetics, Cell Biology, Physiology and Microbiology (see list below).

2) 6 credits of graduate level courses in fields related to biotechnology including Bioinformatics, Engineering, Chemistry, Agriculture, Food safety, Health sciences and Statistics (see approved list below).

Please see the attached graduate program policy for full details of the curriculum:

V. *RESOURCES AVAILABLE*

A. Learning Resources

See attached library assessment statement

B. Faculty / Administrative Resources

The program administrator is Melinda K. Duncan, Ph.D., Tenured Full Professor and Graduate Program Director, Department of Biological Sciences. She has been involved in the administration of graduate programs in Biological Sciences for the past 11 years and has served as the Biological Sciences Graduate Program Director since 2005.

C. External Funding

Dr. Duncan received funding from the Delaware Valley Innovation Network to provide the initial resources necessary to develop this proposal.

VI. *RESOURCES REQUIRED*

A. Learning Resources

The learning resources necessary for basic implementation are generally in place in the form of existing graduate classes in the biological sciences and related fields. In order to compete for both the highest caliber of student and to fulfill the needs of the part-time student population in the future, additional sections of the most popular graduate classes will need to be offered after normal working hours, more courses will need to be developed in fields relevant to biotechnology industry such as fermentation, and the University office of Financial Aid will need to be more responsive to the needs of tuition paying graduate students.

B. Personnel Resources

The Department of Biological Sciences is currently very short of full time faculty to cover existing undergraduate and graduate course offerings. For this program to succeed and expand in the future, additional faculty members qualified to teach graduate courses relevant to biotechnology will need to be hired. In some cases, such faculty could be on supplemental contracts, however, full time faculty members are preferred to ensure the academic rigor of the program.

C. Budgetary Needs

Since the Certificate in Biotechnology is a program with interdisciplinary coursework spread over all five UD colleges, the tuition generated from the program will need to be apportioned to fairly compensate all participants. These decisions need to be at the Dean's level and discussions are ongoing.

We have proposed the following:

1) 20% of tuition shall be for program administration including staff time, computer support, office supplies, teaching buyout and/or salary for the program administrator, etc.

2) The remaining 80% of tuition for classes taken outside of the College of Arts and Sciences will be sent to the College teaching the class.

VII. *IMPLEMENTATION AND EVALUATION*

A. Implementation Plan
All classes for the program will be in place by fall 2010. The program will seek to quickly market the program immediately after program approval is obtained in order to matriculate at least a small class for fall 2010.

B. Assessment Plan

Assessment plan Certificate in Biotechnology

Objectives	**Strategic Activities**	**Measures**	**Short-term Outcomes**	**Long-term Impact**
1. Train students in life science disciplines pertinent to biotechnology	Recruit excellent applicants and matriculate students with credentials similar to those in the existing departmental graduate programs	Number and demographic data of student applicants and matriculated students.	Retention and time to degree statistics	Students gain employment in biotechnology related fields
	Course work covering the disciplines of cell biology, molecular biology, genetics, microbiology, physiology	Faculty evaluation of student progress in course work Surveys of graduate students in the program and post-graduation	Course work for the certificate helped students secure biotechnology related employment and/or helped with research projects in other UD degrees	Graduates enjoy long term success in biotechnology careers
	Course work covering biotechnology related disciplines including	Surveys of students focusing on their experiences in these classes	Course work for the certificate helped students secure biotechnology	Graduates enjoy long term success in biotechnology careers

	agriculture, chemistry, engineering, health sciences, statistics, lab science	Surveys of graduates to determine the utility of these classes to their career Faculty evaluation of student progress in course work	related employment or aided research projects applied toward other UD graduate degrees Students and graduates report applying knowledge from courses to work or academic research settings	

Program improvement will be an ongoing process. The curriculum will be modified as necessary to achieve the goal of producing graduates who apply the knowledge, skills and abilities gained from the Certificate in Biotechnology to their career.

VIII. APPENDICES

A. Accreditation Criteria (if appropriate) N/A

B. Letters of Approval from Contributing Departments

College of Agriculture and Natural Resources
Thomas Sims, Ph.D., T. A. Baker Professor of Soil and Environmental Chemistry Associate Dean for Academic Programs & Research
Department of Entomology and Wildlife Conservation, Judy Hough-Goldstein, Ph.D., Professor and Chair
Department of Food and Resource Economics, Thomas Ilvento, Ph.D., Professor and Chair
Department of Plant and Soil Sciences, Blake Meyers, Ph.D. Professor and Acting Chair
Department of Animal and Food Sciences, Jack Gelb, Ph.D., Professor and Chair

College of Arts and Sciences
Department of Computer and Information Sciences, B. David Saunders Ph.D., Professor and Chair
Department of Chemistry and Biochemistry, Klaus Theopold, Ph.D., Professor and Chair

College of Earth, Ocean and Environment
School of Marine Science and Policy, Charles E. Epifanio, Ph.D., Interim Director and Harrington Professor of Marine Science

College of Engineering
Thomas Buchanan, Ph.D. Deputy Dean of Engineering, Professor of Mechanical Engineering

Department of Chemical Engineering, Norman Wagner, Alvin B. and Julia O. Stiles Professor and Chairperson
Department of Mechanical Engineering, Anette M. Karlsson, Ph.D. Associate Professor and Interim Chair
Department of Electrical and Computer Engineering, Gonzalo Arce, Charles Black Evans Professor and Chair.

College of Health Sciences
Department of Physical Therapy, Stuart A. Binder-Macleod, PT, Ph.D., FAPTA, Edward L. Ratledge Professor and

Chair
Department of Health Nutrition and Exercise Sciences and School of Nursing, James G. Richards, Ph.D. Deputy Dean, College of Health Sciences

University of Delaware Library
Susan Brynteson, Vice Provost and May Morris Director of Libraries

C. Graduate Program Policy

Graduate Certificate in Biotechnology Program Policy

Part I. Program history

A) Statement of purpose and expectations for graduate study
The Graduate Certificate in Biotechnology seeks to provide advanced, interdisciplinary didactic coursework in the life sciences.

B) Date of permanent status-
pending

C) Degrees offered Graduate Certificate in Biotechnology

Part II. Admission

A) Admission requirements
Admission to the Certificate in Biotechnology requires a scholastic index (grade point average on a 4.0 point scale) of at least 2.8 overall and 3.0 in the sciences. Those who meet the stated minimum requirements are not guaranteed admission, nor are those who fail to meet all those requirements necessarily precluded from admission if they offer other appropriate strengths.

There is also the possibility of entering the program after the successful completion of two courses of the Biological Sciences core with a grade of B or better (not B-) as a continuing education student or as a student enrolled in other UD graduate programs and the achievement of an overall GPA of 3.0 in graduate classes attempted.

Applicants who are not U.S. citizens or permanent residents must complete the Test of English as a Foreign Language (TOEFL) with a score of 550 or higher on the paper-based test or 79 or higher on the Internet-based test. Previous education, training or residence in the U.S. does not exempt foreign nationals from these requirements. Requests for a waiver of the language test requirements (for example, for students from English-speaking countries outside of the U.S., or for foreign students who have a college degree from a U.S. institution) must be approved by the University of Delaware Office of Graduate Studies. Students who need further training in English prior to attending graduate school may apply for admission through the University of Delaware English Language Institute's Conditional Admission Program http://www.udel.edu/eli/programs_grad_cap.html.

The Graduate Record Examination is not required of applicants to the Certificate in Biotechnology.

B) Prior degree requirements
BA or BS degree, preferably in a science or engineering discipline

C. Application deadlines.
Fall admission: Full consideration deadline: January 15th with rolling admission to continue until May 1st for foreign nationals and July 1st for US citizens/permanent residents.
Spring Admission: Full consideration deadline: October 1st with rolling admission to continue until November 1st for foreign nationals, December 15th for US citizens/permanent residents.

D. Special competencies needed
Applicants are required to have completed at the undergraduate level the following (or the equivalent): two years of biological sciences; one year of mathematics, preferably to include calculus and/or statistics; one year of college physics; one year of general chemistry; and one course in organic chemistry.

E. Admission categories.
Provisional admission may be offered with the stipulation that any deficiency in undergraduate training be made up (without graduate credit).
Students with TOEFL scores below the minimum required for admission may be considered for conditional admission if they enter the University of Delaware English Language Institute's academic English program.

F. Other documents required
Applications must also include three letters of recommendation from persons able to judge the applicant's ability to pursue graduate study, a resume or CV outlining work and/or academic experience in the field of biotechnology as well as an application essay consisting of the answers to the following questions:

1. What scientific research/employment experience have you had? Please be specific about the field of work and job responsibilities
2. What are your long-term professional objectives?
3. What specific attributes of our Department and the Certificate in Biotechnology make you feel that this degree is appropriate to help you achieve your professional objectives?

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G. University statement:
Admission to the Certificate in Biotechnology program is competitive. Those who meet stated requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths.

Part III. Academic
A. Degree Requirements

1. List course requirements
The Certificate in Biotechnology requires 15 credits of graduate level course work consisting of:

1) 9 credits of graduate level course work in the biological sciences comprised of three classes, spread over at least two of the five following areas: Molecular Biology, Genetics, Cell Biology, Physiology and Microbiology (see list below).

2) 6 credits of graduate level courses in fields related to biotechnology including bioinformatics, engineering, chemistry, agriculture, food safety, health sciences and statistics (see approved list below).

Biological Sciences Core (9 credits, three classes; must include classes from at least two of the five following categories)

Cell Biology	Credits
BISC 612- Advanced Cell Biology	3
BISC 625- Cancer Biology	3
BISC 671- Cellular and Molecular Immunology	4
PLSC635- Plant Developmental Biology	3

Genetics	Credits
BISC 654- Biochemical Genetics	3
BISC 656- Evolutionary Genetics	3
BISC 693- Human Genetics	3
PLSC 636- Advanced Plant Genetics	3
PLSC 605- Plant breeding	3

Microbiology	**Credits**
ANFS 635- Animal Virology	3
ANFS 639- Food Microbiology	3
BISC 641- Microbial ecology	3
BISC 682- Bacterial Pathogens; molecular mechanisms	3
BISC 645- Bacterial Evolution	3
BISC 679- Virology	3
PLSC 619- Soil Microbiology	4
PLSC 629- Introduction to Fungi	4
MAST 618- Marine microbial ecology	3

Molecular Biology	**Credits**
ANFS 670- Principles of Molecular Genetics	3
BISC 602- Molecular Biology of Animal Cells	3
BISC 665- Advanced Molecular Biology and Genetics	3
CHEM642- Biochemistry II	3

Physiology	**Credits**
BISC 605- Advanced Mammalian Physiology	3
BISC 615- Vertebrate Developmental Biology	3
BISC 675- Cardiovascular Physiology	3
HESC 651-Neurophysiological Basis of Human Movement	3
HESC 654- Survey of Medical Physiology	3

Biotechnology-related science courses (two courses from the following list adding up to at least 6 credits)

Agriculture/food science:	**Credits**
ANFS 628- Food Chemistry	4
ANFS 629- Food Analysis	4
ANFS 633- Poultry pathology	3
ANFS 636- Immunology of domestic animals	3
ANFS 637- Avian immunology	3
ANFS 645- Food engineering technology	3
ANFS 649- Food biotechnology	4
ANFS 654- Advanced ruminant nutrition	3
BREG 603/PLSC 603- Soil physics	3
ENWC 611- Insect pest management	3
ENWC 610- Medical, Veterinary, and forensic entomology	3
ENWC 619- Biological control	3
ENWC 805- Insect-plant chemical ecology	3

Bioinformatics:	**Credits**
ANFS 644- Bioinformatics	3
CISC 636- Introduction to bioinformatics	3
CISC 637- Database Systems	3
CISC 681- Artificial Intelligence	3
CISC 683- Introduction to data mining	3
CISC 841- Bioinformatics	3
MAST 697- Bioinformatics programming for Biologists	3
MAST 698- Environmental and systems bioinformatics	3

Chemistry/Biochemistry	**Credits**
CHEM 641- Biochemistry	3
CHEM 645- Proteins, Structure and Function	3

CHEM 646- DNA-Protein Interactions 3
CHEM 649- Molecular Biophysics 3
CHEM 653- Bioinorganic Chemistry 3
CHEM 681- Green Chemistry 3

Engineering:
CHEG 617- Colloid science and engineering 3
CHEG 620- Biochemical Engineering 3
CHEG 621- Metabolic engineering 3
CHEG 625- Green Engineering 3
CHEG 649- Molecular Biophysics 3
CHEG 650- Biomedical Engineering 3
CHEG 805- Multidisciplinary biotechnology 3
CPEG 630- Neurons and networks 3
ELEG 643- Biomedical Nanotechnology 3
ELEG 670- Biophysics of excitable membranes 3
ELEG 671- Introduction to biomedical engineering 3
ELEG 675- Image processing with biomedical applications 3
ELEG 678- Introduction to nano and biophotonics 3
ELEG 679- Introduction to medical imaging systems 3
MEEG 612- Biomechanics of human movement 3
MEEG 682- Clinical biomechanics 3
MEEG 683- Orthopedic Biomechanics 3
MEEG 684- Biomaterials and tissue engineering 3
MEEG 685- Control of human movement 3
MEEG 686- Cell and tissue transport 3

Health Sciences
BISC600- Biotechnology and molecular medicine 3
HESC 601- Research Methods 3
HESC 687- Nursing Sciences Research 3
NURS 621- Advanced pathophysiology 3
NURS 622- Advanced pharmacology 3
NURS 638- Health sciences evaluation 3
PHYT 809- Psychosocial Aspects of Health and Disease 3
PHYT 606- Research 3
PHYT 623- Clinical Neuroscience 3

Advanced Laboratory Techniques
BISC 601- Immunochemistry 4
BISC 604- Nucleic Acids Laboratory 4
BISC 619- Gene Expression Laboratory 4

Statistics/data analysis:
BISC 643- Biological Data Analysis 3
CHEG 604- Probability and statistics for engineering 3
STAT 608- Statistical Research Methods 3
STAT 609- Regression and Experimental Design 3
STAT 611- Regression Analysis 3
STAT 615- Design and Analysis of Experiments` 3
STAT 616- Advanced Design of Experiments 3
STAT 617- Multivariate Analysis 3
STAT 619- Time Series Analysis 3
STAT 620- Nonparametric Statistics 3
STAT 621- Survival Analysis 3
STAT 656- Biostatistics 3
STAT 674- Applied Data Base Management 3

2. Advisement All students will develop a plan of study in consultation with their advisor upon matriculation into the program.

3. Give procedure for petitions for variance in degree requirements (e.g., course substitution policies, completion deadlines, etc.)
All petitions for course substitutions and variances in the completion deadlines must be made to the Graduate Affairs Committee, Department of Biological Sciences.

4. Define any grade minimums in courses that are different from University policy.

Only graduate courses completed with a grade of B or higher fulfill the biological sciences core and the biotechnology-related course requirements for the Certificate in Biotechnology. Students receiving a B- or lower in a required core course are subject to dismissal from the program. However, they may file an appeal to the Department of Biological Sciences Graduate Affairs Committee for approval to retake the course and remain in the program. If the appeal is not approved, the Graduate Affairs Committee will recommend to the Office of Graduate Studies that the student be dismissed from the program.

5. Identify any courses, which may not be used towards the degree
Only courses listed in the curriculum may count towards the degree unless a variance is granted by the Graduate Affairs Committee, Department of Biological Sciences.

6. Identify expectations of facility of expression in English (oral and written) as part of the degree requirement.
Aside from the TOFEL admission requirement for foreign applicants, there are no specific requirements. However, successful completion of the degree will require fluency in both written and spoken English.

B. Committees for exams, thesis, or dissertations
This degree has no thesis or dissertation requirements.

C. Timetable and definition of satisfactory progress towards the degree
1. Academic load
It is expected that the Certificate in Biotechnology will be primarily a part-time program or pursued along with another graduate degree. As such, the only enrollment requirement is that matriculated students must enroll in at least one certificate class per academic year and the certificate must be completed within five years.

Normal progress towards degree is reviewed for all students in the program at the end of every academic year and is assessed based on grades and participation in program activities.

2. Grade requirements (general and specific).
Only graduate courses completed with a grade of B or higher fulfill the biological sciences core and the biotechnology-related course requirements for the Certificate in Biotechnology. Students receiving a B- or lower in a required core course are subject to dismissal from the program. However, they may file an appeal to the Department of Biological Sciences Graduate Affairs Committee for approval to retake the course and remain in the program. If the appeal is not approved, the Graduate Affairs Committee will recommend to the Office of Graduate Studies that the student be dismissed from the program.

3. Thesis/dissertation progress timetable guidelines.
N/A

4. Thesis/dissertation defense guidelines.
N/A

5. Forms required.

Upon completion of the Certificate requirements, the Director of the program will submit the approved plan of study form to the Office of Graduate and Professional Education for audit. The University will state on the student's transcript that the Certificate in Biotechnology was awarded. A diploma for the certificate program is not awarded to the student.

6. Identify consequence for failure to make satisfactory progress.
Students failing to make satisfactory progress towards degree will be identified by the graduate affairs committee in consultation with the student's academic advisor/program director. Recommendations for dismissal are made by the Department chair of Biological Sciences to the University of Delaware Office of Graduate studies.
Students who feel that they have been graded inappropriately or receive what they perceive as an unfair evaluation by a faculty member may file grievances in accordance with University of Delaware policies. Students are encouraged to contact the Department's Graduate Program Director prior to filing a formal grievance in an effort to resolve the situation informally.

Part IV. Assessment Plan
Consistent with the Mission Statement presented earlier in this document, two student learning goals are defined. Students will:

1. Have advanced knowledge of the discipline of biotechnology
2. Achieve competence in scientific communication

The specific goals stated above are mapped to various courses in the program Assessment Plan which guides program evaluation and is filed with the Center for Educational Effectiveness.

These goals will be assessed through multiple indicators including:

- Faculty evaluation of student progress in course work
- Surveys of students and program alumni

Both short term and long term impacts are assessed.

Part V. Financial aid-

Students enrolled in this program are responsible for their own tuition and living expenses. Both the Department of Biological Sciences and University of Delaware Office of Financial Aid will provide assistance in identifying suitable fellowships, grants and loans to help finance their education.

Part VI. Departmental Operations

A. General student responsibilities

Access to Student Records
Students wishing to review their Departmental file must submit a written request to the Graduate Program Director at least 24 hours in advance. Students must review the file in the presence of departmental staff or faculty and are not permitted to remove a file from Wolf Hall but may photocopy documents from their folder. All access to student records is in accordance with the Family Educational Rights and Privacy Act.

Standards of Student Conduct
A)Academic honesty
All graduate students are subject to University of Delaware regulations specified in the University Code of Conduct.

B) Laboratory Safety and Research Regulations
Graduate students performing laboratory research are subject to all University regulations regarding safety, use of human subjects and animals, and hazardous/radioactive material use and disposal. These guidelines may be found in the University of Delaware Policies and Procedures Manual.

C) Contact information
It is the responsibility of all students to ensure that their contact information on file with the university is current (mailing address, phone number, email address). It is also the student's responsibility to regularly monitor their email, phone and mail for important notices regarding their enrollment.

D). Departmental facilities
Occasionally student's graduate assistantship or other assignments may require the use of departmental laboratories or other facilities. Keys to laboratories, etc., are maintained in the Department office and will be issued based on faculty and Department Chair approval.
Any assignments that require the expenditure of departmental funds (e.g. data collection activities) require departmental approval in advance and are processed through the department in which the work is to be done.