

## Proposal to Establish a Graduate Certificate Program

The faculty of the Roy J. Carver Department of Biochemistry, Biophysics and Molecular Biology propose to establish a graduate certificate program in Biochemistry. This certificate will be focused in the BBMB department so this proposal is being routed through the appropriate curriculum committees.

Committee/Administrator	Date	Approval
BBMB Curriculum	Sept. 28, 2016	Yes
CALS Curriculum	Oct. 12, 2016	Yes
LAS Curriculum	Oct. 14, 2016	Yes
LAS Rep. Assembly	Nov. 2, 2016	Yes
Grad. College Curriculum	Nov. 14, 2016	
Grad. Council		
Graduate Dean		
Provost		

## **Name of the proposed graduate certificate.**

Graduate Certificate in Biochemistry

## **Name of the departments and/or programs involved.**

Roy J. Carver Department of Biochemistry, Biophysics and Molecular Biology

## **Name of the contact person.**

Jack R. Girton PhD., University Professor  
Roy J. Carver Department of Biochemistry, Biophysics and Molecular Biology

## **Need for the graduate certificate.**

A graduate certificate provides a mechanism for bestowing formal recognition for graduate study in a focused, specialized area that is less comprehensive than a master's degree. Graduate certificates are attractive to individuals who do not wish to, or cannot at this time, pursue a master's degree or for those who simply wish to add to their credentials in their field. Students for whom this would be an attractive option include individuals with a BS who wish to gain graduate level experience in Biochemistry, either for its own sake or perhaps to gain graduate credit that could later be applied toward a graduate degree program. This would include individuals with a BS degree who are employed in industry and wish to update their education, but who are not able to attend graduate school full time. We believe that a sufficient number of such students exist to justify offering this certificate.

## **Objective of the graduate certificate.**

This certificate will provide interested students with a broad exposure to the core areas of Biochemistry at the graduate level.

## **General description of the graduate certificate.**

The certificate program consists of 12 credits of graduate courses in Biochemistry. These are in two groups. There are four required "core" graduate courses in Biochemistry (BBMB504, 505, 506, and 507), a total of 8 credits. These are the same core courses that all entering Biochemistry graduate students take in their first year. In addition to these courses the certificate students will take additional courses totaling 4 credits from a Departmental list of approved graduate courses.

## **Graduate certificate requirements including:**

### **Admission standards and prerequisites for the certificate program.**

Prospective students must have a BS in Biochemistry with a GPA of at least 3.00, or else hold an equivalent BS degree from an accredited university with a background in Biochemistry equivalent to a 3<sup>rd</sup> year student in the ISU BS program.

### **Courses and seminars.**

#### **12 Cr. in selected graduate level biochemistry courses.**

8 Credits in required courses:

BBMB 504: Amino Acids and Proteins	2Cr
BBMB 505: Bioenergetics and metabolism	2Cr
BBMB 506: Membrane Biochemistry	2Cr
BBMB 507: Biochemistry of Nucleic Acids.	2Cr

4 Credits from the Departmental list of supplemental courses

Current List:

BBMB 510: Molecular Biology and Biochemistry of RNA	2Cr
BBMB 512X: Principles of Glycobiology	2Cr
BBMB 530: Prokaryotic Diversity and Ecology	3Cr
BBMB 531X: Plant Biochemistry	2Cr
BBMB 532X: Enzyme Kinetics and Mechanisms	2Cr
BBMB 542: Introduction to Molecular Biology Techniques	1Cr
BBMB 549X: Nuclear Magnetic Resonance spectroscopy	2Cr
BBMB 551X: Computational Biochemistry	2Cr
BBMB 553X: Current Research in Chemical and Physical Biology	2Cr
BBMB 561: Molecular Biophysics.	2Cr
BBMB 561L: Laboratory in Molecular Biophysics.	2Cr

### **General description of the resources currently available and future resource needs:**

**A list of supporting faculty members including a brief description of their expertise relating to the graduate certificate.**

All faculty members in the BBMB department will be supporting this certificate program. The individuals actively involved in administration and/or teaching the courses in the program are listed below.

Kristen Johansen, Interim Department Chair and Professor  
Regulation of nuclear organization and function

Amy Andreotti, Professor  
Protein structure and function, nuclear magnetic resonance spectroscopy

Adam Barb, Assistant Professor  
Glycoprotein structure and immune activation, nuclear magnetic resonance spectroscopy

Thomas Bobik, Professor  
Conversion of inactive cobalamins to coenzyme B12

Alan DiSpirito, Professor  
Bioenergetics of chemoautotrophic and methanotrophic bacteria

Jack Girton, University Professor  
Chromatin structure and function; regulation of cell determination

Mark Hargrove, Professor  
Heme protein structure and function; regulation of cell determination

Richard Honzatko, Professor  
X-ray crystallography of proteins; enzyme structure/function

Gustavo MacIntosh, Associate Professor  
Gene expression and metabolic changes during plant defense responses to pests; functional genomics of plant nucleases

Scott Nelson, Associate Professor  
Molecular mechanisms of DNA replication and repair

Marit Nilsen-Hamilton, Professor  
Nucleic acid, aptamer-based analytical technology; Growth factor function

Reuben Peters, Professor  
Enzymatic and metabolic engineering of terpenoid biosynthesis

Yeon-Kyun Shin, Professor  
SNARE complex assembly and mechanisms of membrane fusion; EPR methods

Michael Shogren-Knaak, Associate Professor

Role and establishment of histone modifications; Chromatin structure

Eric Underbakke, Assistant Professor

Architecture and assembly of scaffolded signaling complexes

Olga Zabolina, Associate Professor

Plant cell wall structure; polysaccharide biosynthesis, modification and degradation; bioactive carbohydrates

### **The effects of any new courses on faculty workload.**

All courses proposed for the certificate are currently being taught by BBMB faculty, so the only effects on faculty course loads would be from increased enrollment, and increased student advising.

### **Other resources required for the program including graduate assistants, laboratories and other facilities, supplies, etc.**

No additional resources are required.

### **Relationship of the proposed graduate certificate to the strategic plans of the department, college, and the university.**

The proposed certificate is an important part of the BBMB department's plan for graduate education in Biochemistry. With the assistance of resources provided by the Roy J. Carver Trust the department has begun expanding its faculty base through a program of new faculty hiring. This new expertise is allowing the department to expand both its research and educational capabilities. Expansion in graduate education of Biochemistry is one of the Department's key strategic goals. This includes the development of several new graduate courses, increasing the opportunities for BS students interested in graduate education, and in reaching out to nontraditional students, individuals employed in professional careers in a variety of academic and industry environments who are interested in continuing education / advanced training but who cannot take time to enroll in a full time graduate program.

### **Plan for periodic review of the certificate program.**

The certificate program will be formally reviewed by the BBMB department on a 5 year basis.