Part One: Guidelines

1. BC499B-D (3 credits)
   You may only register for Senior Thesis, BC499B-D, a 3 credit one semester course, in your senior year. BC499B-D is similar to an independent study in that you are working directly with your instructor to create the learning experience. For an idea of the hours involved, three credits are equivalent to approximately 135 hours of work per semester. This breaks down to roughly 10 hours of work per week until the due date of the final draft of the thesis. This is consistent with the time any 300- or 400-level class typically requires. It will take a serious commitment of time and effort to complete your thesis, and you must work on your thesis on a regular weekly basis! Do not wait until the week before a draft is due. BC499B-D uses a traditional grading scale (A, B, etc.). Your final grade is decided by your instructor and is based on the quality of your written work and your oral presentation.

2. Definition of the Thesis
   The BC499 thesis is designed to provide a culminating experience that allows students to explore areas of Biochemistry and Molecular Biology about which they are most passionate, engage in the process of discovery, and make a creative contribution in their areas of interest and expertise. The Thesis is to be an original work by the author based upon a combination of review and original literature articles from the recent scientific publications. At least four primary literature references must have been published in the twelve month period before the formal proposal due date. Limited quotations may be incorporated into the thesis with proper quotation marks and references, but the majority of the thesis is to be written by you as the author.

   A BMB faculty member supervises the senior thesis experience. The duty of the instructor is to assist the students in the thesis writing process. The thesis has writing, reviewing, editing and presentation components. The written thesis will be 4000 words minimum (text only excluding figures, figure legends, and references), 6000 words maximum, double-spaced (1” margins, 12 point type, Times or similar font). The BC499B-D thesis style will be based on that of a “Trends in X” article (also see section 4 for specifications). The presentation component consists of an oral presentation by the student and responses by the student to questions from the instructor and fellow students.

3. Deadlines
   To ensure adequate progress of writing a thesis, BC499B-D has several mandatory due dates to turn in written forms and thesis drafts. The grades associated with each assignment and the deadline dates are listed in section 6 of this document. Failure to meet any deadline will result in an automatic zero points for that assignment, and if you miss the peer review deadline you will get an automatic F in the course, meaning you will have to retake it in order to graduate.

   All the written materials should be received by 4:00 P.M. on the specified due date unless otherwise indicated.
Thesis Writing Timetable

Preliminary Proposal
This step should have been completed by the end of BC493. The preliminary proposal is intended to help focus your ideas and generate a thesis topic. Use the BC499B-D Thesis Preliminary Proposal Form, included in this packet, to briefly describe your topic and then submit it to the departmental office by the due date. On this form you will also indicate your preferred instructor to mentor the development of your Senior Thesis – we will try to match students up with appropriate instructors based on their thesis topic and preference. At this stage you should feel free to contact any of the course instructors for help in deciding on your thesis topic.

Formal Proposal
The BC499B-D Thesis Formal Proposal is a comprehensive statement about your thesis topic and plans. Your instructor must approve your proposal. If you wish to change your topic after submitting the formal proposal, your instructor must approve the new proposal. The BC499B-D Thesis Formal Proposal Form is part of this document and is to be submitted to the department office by the date specified on the form.

Preliminary Draft Thesis for Instructor Review
This preliminary draft of your thesis is targeted to keep you on schedule. You should have determined the organization of your entire thesis (with titles for the subsections) and this draft should include at least the first two pages of the introduction close to its final form and all sections in some preliminary form. The draft is to be submitted to the department office by the date specified on the timeline.

Draft Thesis for Peer Review
This draft should contain all sections of the thesis and be very close to your “final” version. The draft thesis is to be submitted in electronic format as a SINGLE .doc file to your primary instructor and copied to Dr. Stargell. Dr. Stargell will distribute copies of each manuscript to two students in the course for peer review. The peer reviewers will have ~10 days to read the proposals and make specific recommendations to the authors, as per the Peer Review Guidelines page of this Guide. A significant portion of the course grade will be based on the quality and thoroughness of the peer reviews and we expect you to make constructive comments.

The completed peer reviews, consisting of two documents per thesis (a marked up version of the thesis and answers to the Peer Review questions) will be submitted electronically to your instructor. The instructor will grade your reviews and then return the manuscript with the reviews to the authors for their consideration. Authors may elect to revise the manuscript in accordance with the reviewer’s comments, or otherwise alter the manuscript appropriately to improve the final version of the thesis.

Final Draft of Thesis
Students submit two paper copies of the final printed version of their thesis to the Biochemistry Office. The student should have responded appropriately to the peer reviewers in this version of the thesis. We expect the thesis to be in excellent form by this stage of the process, clearly written and informative with no spelling or grammatical errors, and figures integrated into the text. The quality of the thesis itself will comprise 40 % of your final grade.

Thesis Presentation
The presentation is an opportunity to present your thesis to your peers and instructors. You must give an oral presentation about your thesis to the instructor and class during the last week of classes. The BC499B-D thesis presentation differs from a graduate thesis defense in that it is less formal and more of an opportunity to share your learning experience with your peers.
The senior thesis oral presentation is open to the public and will be publicized to students, faculty, and staff of the Department of Biochemistry and Molecular Biology by posting on the department’s website and printed announcements. Faculty, staff, students, family members, and other interested individuals are welcome to attend and to ask the student questions about the thesis presentation.

4. Specifications for the final copy of the senior thesis

1. The written thesis must consistently follow a writing style appropriate for the type of research in the thesis. The style and standards are determined by your instructor, but will generally follow that of a “Trends in X” (there are many to choose from) article.
2. The thesis must be 4000 words minimum, 6000 words maximum, double-spaced (6 lines per inch), single column, 1” margins all around, 12 pt type, Times or similar font. The pages should be numbered.
3. The cover page of your final thesis should contain the title of your thesis, your name, the date, followed by "Submitted to the Department of Biochemistry and Molecular Biology, Colorado State University, in partial fulfillment of the requirements for a B.S. Degree (BC 499B), Spring 2012”
4. The thesis should be based on at least a dozen primary papers from the scientific literature, in addition to relevant review articles. Four of the primary papers must have been published in the previous twelve months.
5. Primary references must be to scientific journal publications, not to web sites. Cite your references following the format of the journal “Biochemistry” with the Endnote program.
6. Plagiarism in any form will be monitored closely and not tolerated. Students guilty of plagiarism will receive a failing grade in the class, and appropriate disciplinary action will be taken.

5. Grading

This course uses conventional grades (i.e. A, B, C, D, and F). A total of 100 pts are divided as outlined in the deadline summary shown below. Failure to turn in an item on time will result in a grade of zero for that item. Turning in shoddy or incomplete work will result in a partial grade.

IMPORTANT NOTE: a course grade of F will be issued if you fail to turn in your thesis for peer review on time because it is imperative that all students participate at this stage.

6. Deadlines and Grading Summary

Items due by 4 P.M. unless otherwise stated

February 2nd, 2012 Preliminary Proposal form due in Departmental Office (5 pts)
February 16th, 2012 Formal Proposal form with instructor approval due in Dept Office (5 pts)
March 1st, 2012 Preliminary draft of thesis due in printed form to BC office (5 pts)
March 29th, 2012 Complete thesis draft for peer review by e-mail to your instructor (15 pts)
April 2nd, 2012 Theses available for peer review via RamCT
April 13th, 2012 Peer reviews of two other theses due by e-mail to your instructor (15 pts)
This includes addressing the review criteria provided and making comments on the theses.
April 26th, 2012 Final thesis due in printed form to the BC Office (40 pts)
May 1st & 2nd, 2012 Oral presentations – 3:00-7:00 P.M. with exact times to be scheduled (15 pts)
Part Two: Thesis Methods and Writing

Selecting a topic
Completing a thesis is a rigorous and time-consuming endeavor, so you should select a topic that is both intellectually exciting and challenging. We encourage you to use your BC493 seminar topic as a starting point to facilitate writing the thesis. The following are some additional helpful hints about selecting and/or defining a topic:

> Remember, you are expected to commit approximately 10 hrs per week working on this course until the due date of the final thesis.
> Start a “topics file” in which you keep track of potential areas of interest. Review your file to see if there are recurrent themes to your interests.
> Ask yourself the following questions: What Biochemistry and Molecular Biology topics have most engaged me? What am I most curious about? What do I enjoy? What am I most passionate about?
> Visit with faculty and discuss ideas with them. They have a great deal of experience and knowledge that will help you discover a topic.

We encourage you to visit the Undergraduate computing room (103 MRB) and read through past theses to get a better feel for the full range of topics and proper formatting.

Thesis Methods and Approaches
Research and scholarship methods and approaches vary. Therefore, it is important to meet with your primary thesis instructor to discuss accepted guidelines for your thesis area. An excellent resource for research by discipline can be found on the Writing Center webpage [http://writing.colostate.edu/](http://writing.colostate.edu/). This site discusses many aspects of writing such as research techniques, using print and electronic sources, and citing sources.

Writing Styles
Specific writing styles vary by discipline, so you should consult with your BC 499B instructor for guidance about the writing style appropriate for your topic. In general, the thesis style should be based on that of a “Trends in” article. For each style, there are manuals to help you understand and stay within the boundaries of your discipline. In addition, the Writing Center has writing guides available online.

The written component of the thesis experience must incorporate the fundamentals of writing that you have learned in your composition courses. You need to pay particular attention to:

> organizing your writing for your audience;
> engaging in writing as a process which includes formal and informal writing, and writing multiple drafts that are reviewed and subsequently revised;
> utilizing the writing expertise you have learned while writing summaries, syntheses, evaluations, and arguments in your Freshman Seminar and composition courses;
> cohesion of ideas and document formatting
> editing and proofreading
> utilizing appropriate citation styles.

Finally, a thesaurus and dictionary are essential tools for good writing, but comic and sometimes tragic results come from relying solely on your computer Spell Check. Although invaluable, it is not foolproof.
Peer Review Criteria

Remember to both describe and advise in your responses to all the questions below. Rather unhelpful “yes/no” responses are not acceptable.

Overall Responses:
1. What is your overall response, your gut reaction, to the thesis? Why?
2. What did you like best about the thesis? Why?
3. What did you like least about the thesis? Why?

Focus:
1. Is the thesis clearly written? Why or why not?
2. Does the thesis offer new insight and deal with complex and compelling issues? Why or why not?

Development for Audience:
1. Who is the audience for this thesis? Try to put yourself into the position of the intended audience of this piece. Who are you and what are your values? Why?
2. Identify one section of the thesis that is well developed with solid evidence and examples. Why is this a well-developed section?
3. Identify at least one section of the thesis that needs further development and support. Offer concrete suggestions for the author to develop that section.

Organizations:
1. Are paragraphs well-developed and clearly linked to the author’s focus?
2. Comment on at least two transitions. Does the author provide clear transitions between paragraphs? Does the thesis “flow” from idea to idea? Why or why not?

Style:
1. Describe the tone or voice of the thesis in one adjective.
2. Is the tone appropriate for the audience? Why or why not?
3. Comment on the author’s sentence structure. Is it varied and engaging? Choose one paragraph as an example for your analysis.

Conventions:
1. Does the author have any patterns of sentence-level errors that impede your reading? If so, comment on them.
2. Are the references appropriate in style, format and content?
Suggest References and Sources of Topic Ideas

Search resources:
   PubMED (Search by author, subject, year, journal):

   Web of Science (Search more recent papers that reference one you already have):
      1. Go to CSU “Library” link: http://lib.colostate.edu
      2. Go to the “Articles & Databases” tab
      3. Select “Web of Science – scholarly articles”

Primary Literature (Peer reviewed)
   General areas in science:
      Science
      Nature
      Proceedings of the National Academy of Sciences

   Biochemistry and Molecular Biology
      Cell
      Nature Structure and Molecular Biology
      Nature Medicine
      Nature (and related journals)
      Biochemistry
      Molecular and Cellular Biology
      Journal of Biological Chemistry
      Journal of Molecular Biology
      Nucleic Acids Research
      Proteins
      Protein Science

Review Journals
   Trends in Biology
   Trends in Biochemical Sciences
   Trends in Cell Biology
   Trends in ... (see library for full listing)
   Current Opinion in Cell Biology
   Current Opinion in Structural Biology
   Current Opinion in ... (see library for full listing)
   Journal of Biological Chemistry Minireviews
Titles of Some Recent Theses

Fragile X Associated Tremor/Ataxia Syndrome

Vitamin D, sunlight and cancer

RNA Polymerase Pausing

Mechanisms and Mutations of HER2 and its Subsequent Role in Cancer Growth

Genetically Engineered Lymphocytes as a Possible Treatment of Cancer

Improvements in Acetylcholinesterase Inhibitors in the Treatment of Alzheimer’s Disease

The Role of p53 and Associated Proteins in Lung Cancer

Regulation of the KiSS-1 Gene in the Metastasis of Breast Cancer

HIV Induced Neuropathogenesis

Viability of Viruses as Vectors for Cancer Therapy

The Significance of the BCR-ABL Tyrosine Kinase on Chronic Myeloid Leukemia

RNA Polymerase Inhibitors: Antibacterial Drug Targets

Peroxisome Proliferator-Activated Receptors: A link to treating Diabetes and the Metabolic Syndrome

Mechanism of Biological Non-canonical RNA Trans-splicing

Regulation of the mecA Gene and Protein Product PBP2a in Nosocomial MRSA
Form 1
BC 499B-D THESIS
PRELIMINARY PROPOSAL

Please complete the preliminary proposal form, and submit to the Biochemistry office by 4:00 P.M. on Thursday, February 2\textsuperscript{nd}, 2012. If you have any questions, please visit with any of the instructors for the course prior to the deadline. \textbf{Please type.}

Name: ____________________________  eID: ______________________________

Phone: ____________________________  E-mail: ______________________________

Major(s) and Minor(s): ________________________________

Semester and year you intend to graduate: ____________________________

Preference for primary thesis instructor: ____________________________ (the official assignment will use your preference and will also consider faculty expertise with your chosen topic)

Tentative thesis title: ________________________________

\textbf{Thesis description:} Describe the questions you plan to address in your thesis. Explain why you are interested in this topic.

________________________________________________________________________

________________________________________________________________________

Student signature ____________________________  Date ____________________________

BC499B-D Guidelines (1/2012)
Form 2  
BC499B-D THESIS  
FORMAL PROPOSAL

Please complete the formal proposal form and submit the approved form to the Biochemistry Office. The Formal Proposal is due by 4:00 P.M. on Thursday, February 16th, 2012. Approval by your primary BC 499B instructor is required. Please type.

Name: ________________________
Phone Number:__________________ Email:______________________________

Primary Instructor: ________________________

Thesis Title: ____________________________________________________________

Please attach a description of your thesis that provides the following:

> An abstract (200-250 words)
> An outline of your thesis
> A list of references you have used to date.

_________________________________________ Date
Student signature

_________________________________________ Date
Primary Instructor signature

BC499B-D Guidelines (1/2012)
Form 3 - BC499B-D THESIS
Peer Review Criteria

Please complete the question shown here and submit to your instructor by **4:00 P.M. on Monday April 13th, 2012. Please type.** Remember to both describe and provide suggestions to the author in your responses to all the questions below. Rather unhelpful “yes/no” responses are not acceptable.

Your name: ____________________________________________

Thesis author’s name: ________________________________

**Overall Impression:**
1. What is your overall response, your gut reaction, to the thesis? Why?
2. What did you like best about the thesis? Why?
3. What did you like least about the thesis? Why?

**Focus:**
4. Is the thesis clearly written? Why or why not?
5. Does the thesis offer new insight and deal with complex and compelling issues? Why or why not?

**Development for Audience:**
6. Who is the audience for this thesis? Try to put yourself into the position of the intended audience of this piece. Who are you and what are your values? Why?
7. Identify one section of the thesis that is well developed with solid evidence and examples. Why is this a well-developed section?
8. Identify at least one section of the thesis that needs further development and support. Offer concrete suggestions for the author to develop that section.

**Organization:**
9. Are paragraphs well-developed and clearly linked to the author’s focus?
10. Comment on at least two transitions. Does the author provide clear transitions between paragraphs? Does the thesis “flow” from idea to idea? Why or why not?

**Style:**
11. Describe the tone or voice of the thesis in one adjective.
12. Is the tone appropriate for the audience? Why or why not?
13. Comment on the author’s sentence structure. Is it varied and engaging? Choose one paragraph as an example for your analysis.

**Conventions:**
14. Does the author have any patterns of sentence-level errors that impede your reading? If so, please comment on them.
15. Are the references appropriate in style, format and content?