POLICIES AND ACADEMIC GUIDELINES FOR GRADUATE STUDENTS

FREE RADICAL AND RADIATION BIOLOGY PROGRAM

THE UNIVERSITY OF IOWA

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I. INTRODUCTION

The Free Radical and Radiation Biology Graduate Program (FRRBP) is a subprogram/member of the Biomedical Science Program within the Graduate College of The University of Iowa. The Free Radical and Radiation Biology Program is in the Department of Radiation Oncology in the College of Medicine.

The Free Radical and Radiation Biology Graduate Program is interdisciplinary with the possibilities of a major emphasis in Radiation Biology or Redox Biology. Although students with diverse academic backgrounds may enter the Program, each student should have a science background which includes: a) at least two years of chemistry including organic chemistry; b) at least one year of physics; c) at least two years of biology; and d) mathematics including at least one semester of calculus. Since students have different career objectives, each program of study is designed to help achieve career objectives and to reflect the student's major interests.

What is Redox Biology? Redox biology is the study of the interaction of free radicals and related oxidants with biological material. These species are fundamental to good health. However, there is an imbalance associated with many human health issues; this imbalance could be either the cause or the effect of the of the health issue.

Free radicals are atoms or molecules with at least one unpaired electron. Free radical biology is closely related to radiation biology since 70-80% of the effect of radiation on cells is due to the production of free radicals. The study of free radicals has become of extreme interest because of the role of free radicals and related oxidants, such as hydrogen peroxide, in a large number of diseases and pathological states. As examples, cancer, aging, heart attacks, strokes, diabetes, and Lou Gehrig's disease all have a free radical/oxidant component to the mechanisms of injury. Nationally and internationally, the use of free radical/oxidant modulators in the prevention and treatment of disease is under close investigation at this time including clinical trials.

What is Radiation Biology? The science of radiation biology is dedicated to understanding the effects of radiation on living things. The effects of radiation on living organisms are considered paradoxical. For example, radiation not only is known to cause cancer, but also is used to treat cancer. Studies on the physical, biological, and chemical changes that follow the interaction of radiation with living matter are of fundamental importance in understanding how radiation can be used to investigate normal and aberrant cell structure and function, and to diagnose and treat various diseases, particularly cancer.

The admission of new students depends on the qualifications of the applicant as well as the ability of the Program to support new students. All students must conform to the rules and regulations of the Graduate College detailed in the Manual of Rules and Regulations of the Graduate College. Accordingly, a minimum grade-point average of 3.0 (A = 4.0, B = 3.0, etc.) is required for admission with regular status as a candidate for a Master's Degree (M.S.). At least 30 semester hours (s.h.) of graduate credit must be completed for the M.S. degree. The student must maintain a grade-point average of at least 3.0 on graduate work completed at The University of Iowa. A minimum grade-point average of 3.0 (A = 4.0, B = 3.0, etc.) is required for admission with regular status to the doctoral program. The doctoral program must contain at least 72 semester hours of graduate credit (including transfer credits and credits earned for the M.S. degree). It is expected that students who enter the Program with a baccalaureate degree will complete the M.S. degree within 2-3 years and the Ph.D. within 4-5 years (including coursework). To progress satisfactorily in the Program, all students must:

(1) maintain a grade-point average of at least 3.0 on all graduate work completed at The University of Iowa.
(2) conform to the Graduate College regulations for residence requirements, plans of study, degree examinations, and dissertations.
(3) meet the additional, specific requirements of the Free Radical and Radiation Biology Program.

Because of the diversity of student backgrounds, interests, and career objectives, the specific Program requirements can sometimes be modified or waived. Variances from the Program requirements may be requested in writing from a student to the Director of the Program (Section III-H).

To ensure the continued excellence of the program, both faculty and students must make important commitments as listed below.

The faculty should strive to:

(1) Provide an environment in which scholarly achievement and the conduct of meritorious scientific research is not only possible, but expected.
(2) Encourage and support creative original research.
(3) Periodically review Program requirements and content and update as needed.
(4) Serve as models of teaching, scholarly pursuit, and research effort to be emulated by the students.

The students should strive to:

(1) Achieve and demonstrate a clear understanding of the material presented in courses, a general knowledge of current scientific literature, and a thorough knowledge of the literature in their area of major emphasis.
(2) Demonstrate an aptitude for all aspects of scientific research, i.e., a familiarity with the relevant literature, the formulation of a hypothesis, and the lucid presentation of the research in both written and oral form.
(3) Produce research results worthy of publication.
(4) Advance in teaching and classroom skills.
(5) Seek and take advantage of opportunities to improve communication skills.
(6) Excel during graduate training and after graduation.

Any exceptions to the Guidelines requested by a student, relative to the FRRBP Guidelines, need to be put in writing, submitted to the faculty, and then will be discussed and voted on by the faculty on a case by case basis.

II. SUMMARY OF COURSES IN THE FREE RADICAL AND RADIATION BIOLOGY PROGRAM

A. Courses offered by Free Radical and Radiation Biology Program Faculty

Course	Course Title	Credits
FRRB:5000	Radiation Biology (Spring, odd years)	4
FRRB:4000	Special Topics: Advanced Undergraduates	arr.
FRRB:6000	Seminar: Free Radical and Radiation Biology	1
FRRB:3110	Medical Physics I (Fall)	4
FRRB:3215	Medical Physics II (Spring)	
FRRB:7000	Redox Biology and Medicine (Spring, even year)	4
FRRB:7001	Molecular and Cellular Biology of Cancer (Fall offered live odd year)	3
FRRB:6004	Research: Free Radical and Radiation Biology	arr.
FRRB:5001	Special Topics	arr.
FRRB:5005	Rigor and Reproducibility in Redox and Radiation Biology (Fall, even year)	1
FRRB:6006	Current Topics in Free Radical Biology	1
FRRB:6008	Current Topics in Radiation and Cancer Biology	1
RSMN:5020	Radiation Safety & Radiobiology (Fall)	4
BMED:7270	Scholarly Integrity/Responsible Conduct of Research 1	1

*B. Courses offered by other departments **required** for Ph.D. Program*

Course	Course Title	Credits
PCOL:5204	Basic Biostatistics & Experimental Design	1
BIOC:7251	Introduction to Protein Structures	1
BIOC:7252	Enzymes, Carbohydrates, Nucleic Acids, and Bioenergetics	1
BIOC:7253	Metabolism I	1
MMED:6226	Cell Cycle Control	1
BMED:5207	Principles of Molecular and Cellular Biology	3
BMED:7270	Scholarly Integrity/Responsible Conduct of Research 1	0
BMED:7271	Scholarly Integrity/Responsible Conduct of Research 2	0

*To meet compliance requirements you MUST TAKE BOTH courses but the order does not matter.

Students must select two courses (***required***) from the following

MMED:6225	Growth Factor Receptor Signaling	1
MMED:6227	Cell Fate Decisions	1
BMED:5205	Practical Bioinformatics	1

C. Electives often recommended to supplement required courses (should discuss with advisor)

Course	Course Title	Credits
BIOC:7254	Metabolism II	1
BIOC:7255	Metabolism III and Biosignaling	1
BIOC:7256	Molecular Biology	1
BIOL:3713	Molecular Genetics	4
ACB:4156	Scanning Electron Microscopy & X-ray Microanalysis	3
ACB:5218	Electron Microscopy Techniques	3
MICR:3147	Survey of Immunology	4
MICR:2157	General Microbiology	5
MICR:6201	Immunology I	3
OEH:5710	Environmental Toxicology	3
PATH:5270	Pathogenesis of Major Human Diseases	3
PATH:8133	Introduction to Human Pathology	4
PATH:5260	Translational Histopathology	3
BIOC:3140	Experimental Biochemistry	4
MMED:6220	Cell Biology I	3

MMED:6225	Cell Biology II	3
MMED:6215	Transcription RNA	1
MMED:6220	Mechanisms of Cellular Organization	1
PSQF:6217	Seminar in College Teaching	3

*D. 1. Example of academic schedule of **major** courses offered by the Program and the Graduate College*

Year	Fall 2020	Spring 2021	Summer 2021
2020-21	FRRB:7001 Molecular and Cellular Biology of Cancer (Digital Format) FRRB:5005 Rigor & Reproducibility FRRB:6000 Seminar[a] FRRB:6004)5 Research FRRB:6006 Current Topics in Free Radical Biology[a] FRRB:6008 Current Topics in Radiation and Cancer Biology[a] BIOC:7251 Intro. to Protein Structures BIOC:7252 Enzymes, Carbohydrates, Nucleic Acids, and Bioenergetics BIOC:7253 Metabolism I PCOL:5204 Basic Biostatistics & Experimental Design FRRB:3110Medical Physic I xxx:yyy Electives	FRRB:5000 Radiation Biology FRRB:6000 Seminar[a] FRRB:6004 Research FRRB:6006 Current Topics in Free Radical Biology[a] FRRB:6008 Current Topics in Radiation and Cancer Biology[a] FRRB:3215 Medical Physic II xxx:yyy Electives	FRRB:6004 Research (1 h) * consult with advisor xxx:yyy Electives

[a]New students are not expected to register for these courses, but if their course schedule permits attendance is expected.

Year	Fall 2021	Spring 2022	Summer 2022
2021-22	FRRB:7001 Molecular and Cellular Biology of Cancer (Live) FRRB:6000 Seminar[a] FRRB:6004 Research FRRB:6006 Current Topics in Free Radical Biology[a] FRRB:6008 Current Topics in Radiation and Cancer Biology[a] BIOC:7251 Intro. to Protein Structures BIOC:7252 Enzymes, Carbohydrates, Nucleic Acids, and Bioenergetics BIOC:7253 Metabolism I BMED:5203 Principles of Molecule & Cellular Biology BMED:7270 Scholarly Integrity/ Responsible Conduct of Res 1 xxx:yyy Electives	FRRB: 7000 Redox Biology and Medicine FRRB:6000 Seminar[a] FRRB:6004 Research FRRB:6006 Current Topics in Free Radical Biology[a] FRRB:6008 Current Topics in Radiation and Cancer Biology[a] BMED:7271 Scholarly Integrity/ Responsible Conduct of Research 2 xxx:yyy Electives [a]New students are not expected to register for these courses, but if their course schedule permits attendance is expected.	FRRB:6004 Research (1 h) * consult with advisor xxx:yyy Electives

Commented [GRB1]: I moved this from Fall '21

III. GENERAL POLICIES AND REGULATIONS OF THE FREE RADICAL AND RADIATION BIOLOGY PROGRAM

A. Financial support

Although the Free Radical and Radiation Biology Program is not obligated to provide financial support to the graduate students in the program, support has usually been available for the students' entire graduate program. The funds are obtained from three sources:

(1) Research grants awarded to individual faculty members.
(2) Training grants awarded to the University for the training of pre-doctoral and post-doctoral students.
(3) Graduate College and College of Medicine funds awarded to the Free Radical and Radiation Biology Program for student research assistantships, teaching assistantships, and tuition scholarships.

The judicious expenditure of funds from source (1) is the responsibility of the Principal Investigators. They must approve of the awarding of any *research assistantships* paid by funds from their research grants. The renewal of these assistantships is dependent upon the availability of funds and the satisfactory performance of the duties assigned by the Principal Investigator.

The decision to award a *pre-doctoral* or *post-doctoral stipend* from a Training Grant, source (2), is made by the principal investigator of the grant with the concurrence of a Steering Committee. Renewal of the stipend is dependent on the satisfactory progress of the student as determined by the academic record and evaluation by the faculty, the limitations imposed by the terms of the grant, and the duration of the grant.

The awarding of an *assistantship* from source (3) is recommended by the Director of the Free Radical and Radiation Biology Graduate Program with the concurrence of the Program faculty. The award can be renewed when appropriate and when funds are available.

Most awards (*e.g*., from training grants) pay tuition in addition to a stipend. Some assistantships do not pay tuition, but do confer "resident" status with consequent lower tuition fees provided the appointment is at least 1/4 time. Federal, state income taxes, and social security taxes, are withheld from an assistantship stipend. Under some circumstances, it may be possible to recover federal income taxes withheld; although Program personnel may have relative information, it is each student's responsibility to deal with the Internal Revenue Service.

The obligations associated with a stipend vary and depend on the source. Any graduate assistantship (research or teaching) provided by university funds will be coupled to a service requirement. These assistantships are usually either 1/4- or 1/2-time assistantships for which 10 or 20 hours, respectively, of service is required per week. The obligations associated with a stipend provided by the grant of a principal investigator, usually the advisor, are at the discretion of the advisor. Appointments are usually for a fiscal year from July 1 to June 30 of the following year. Newly appointed assistants may begin at a different time, usually coinciding with the beginning of a semester. The students will be notified of an appointment as soon as practical after the Program budget for the next fiscal year has been determined, usually in the period from April to June. Official notification of an appointment is made by the Office of the President of The University of Iowa. If the funds that provide an assistantship are terminated or are scheduled for

termination, the affected individual will be notified as quickly as possible and efforts will be made to obtain funds from another source.

The Free Radical and Radiation Biology Program expects to provide financial support for the expenses of a graduate student's research. Funds are more readily available when the student's research objectives coincide with those of a research grant that has been awarded to a faculty member.

All costs associated with the preparation of a thesis are the responsibility of the student. However, when some of the graphs, photomicrographs, diagrams, etc. can also be utilized for reports or publications associated with a research grant, some support for the production costs may be provided. The costs of preparing the proposal for the Ph.D. comprehensive exam are paid by the department. The costs of preparing a thesis are a student's obligation.

B. Vacation

Vacation policy for students who receive stipends is as follows:

(1) All vacations must be arranged in consultation between a student and his/her advisor. Vacation forms available from the Program office **must** be filed.
(2) Students are entitled to all official University holidays.
(3) Additional absence during usual working hours should not exceed 15 days per year.
(4) Up to 30 days of vacation time may be accrued. Students are advised to use their vacation time each year.
(5) Some appointments may have specific vacation guidelines that vary from the general guidelines above.
(6) Records of vacations and sick leave will be kept on file in the Program office and utilized only as internal records.
(7) A leave of absence without pay may be granted at the discretion of the advisor with concurrence of the faculty. It remains the responsibility of the student to maintain the registration requirements of the university.
(8) Students who are repeatedly absent without permission will be given a written warning. After three such warnings, the student’s appointment may not be renewed.

C. Advisors

Each new student will be advised in the first year by the Program Director, who should be consulted regarding the student's schedule of courses for the first semester. The student and advisor should then develop a Plan of Study as soon as possible and not later than the beginning of the second semester of enrollment. This Plan can be revised later if necessary. Students are also required to rotate through three laboratories in their first year to determine research interests of all faculty members. These rotations must be approved by the Program Director. Then, by the end of the first year, and by mutual consent of the student and a faculty member, the student must choose a permanent advisor whose research interests most closely coincide with those of the student. This decision may also be influenced by the research and teaching load of a potential advisor and the research and stipend funds that a potential advisor can use at his discretion. Nevertheless, the permanent advisor **must** be chosen by the end of the first year. The permanent advisor may be the same as the temporary advisor. The student may select different advisors for the M.S. and Ph.D. degrees. During a degree program, a student may also switch advisors, but if this occurs, the student should be aware that a stipend may no longer be available.

D. Seminar

Each student must give one seminar for credit a year for three years. Students should not register for seminar their first year. All students are **required** to attend and participate regularly in the program seminar series and are strongly **encouraged** to interact with the speaker through questions and comments. Attendance at other seminars and lectures outside the department is also encouraged.

Performance in the program seminars is evaluated with a letter grade. The presenting student will meet briefly with the attending faculty immediately after presentation of a seminar to receive an evaluation of his/her performance.

E. Scientific meetings, workshops, and short courses

Student attendance at scientific meetings, symposia, short courses, or workshops is encouraged. Presentation of a paper or a poster at a meeting is **required** to obtain financial support from the Program. Students may request permission to attend or a faculty member may suggest that the student attend. There is no limit on the number of meetings a student may attend. There is no obligation on the part of the faculty or the Program to provide funds for student travel to the meetings. Where individual research grants can pay travel expenses, decisions about travel support are made by the principal investigator(s). When other departmental funds or special travel awards are available, decisions about student travel support will be made by the faculty as a group.

F. Research reports

Students enrolled for research credit are **required** to submit a research report to their advisor on the last day of classes each semester. The report will be evaluated and graded by the advisor. The report should define the goals, aims and objectives for the specific semester, and describe the progress made by the student toward completion of the research objectives. The report does not need to be lengthy, and may consist of abstracts, drafts of papers, or thesis chapters being prepared for submission to peer reviewed journals or for the thesis.

G. Student progress reviews

The progress of each student in the Program is reviewed by the assembled faculty at the end of the Fall and Spring semesters (soon after grades are issued). The research report (Section III-F.) will be shared with the faculty as part of the overall review. Each student will receive a letter from the Director of the Program that includes an evaluation of their progress. Should the student's progress be considered unsatisfactory by the faculty, the student will be notified, and the deficits noted. Suggested remedial measures will be included in the letter. Continued lack of satisfactory progress after the written notice describing the weaknesses may be grounds for dismissal of the student from the Program. The student may appeal this decision (Section III-I.).

H. Variations from Program requirements

If a student wants to deviate from the usual program requirements or course of study, the student, after consulting with their advisor, must request permission for this variation and justify the variance in writing to the Director of the Program who will present the request to the faculty. In some instances, it may be desirable for the student to personally present the request to the faculty. The faculty will discuss the matter

and then decide whether to grant the request. The Program Director will promptly notify the student of the faculty decision; the notification may be verbal with confirmation in writing. If a student feels that the faculty decision is improper, the student may appeal the decision as outlined in Section III-I. that follows.

I. Appealing a faculty decision

If a student feels that a dismissal decision or other major decision pertaining to the student's status is improper, the student may appeal the decision in writing to the Director of the Graduate Program with copies to other faculty members if desired. A special committee will then be constituted; the committee will be composed of (1) the student's academic advisor, (2) the Director of the Program or a designated representative, and (3) another faculty member from the College of Medicine whose selection is mutually agreeable to the student and the Director. This committee will meet with the student within 10 working days from the time that the written appeal is lodged with the Program Director. The decision of the committee will be final except in the conditions outlined by the Graduate College. Accordingly, questions involving judgment of performance will not be reviewed beyond the department level. If, however, the student feels there has been unfairness or some procedural irregularity concerning dismissal, the student may request a review by the Graduate College. The review by the Graduate College is final.

J. Role of the student representative to faculty meetings

The students may select two representatives who are encouraged to attend all regular meetings of the Free Radical and Radiation Biology Faculty. The student representatives have the primary responsibility of acting as a medium for exchange of information and ideas between faculty and students. The student representatives should meet with the students regularly and transmit significant proceedings of the faculty meetings, as well as encourage students to voice their opinions.

K. Test of English as a Foreign Language (TOEFL) requirements

The Graduate College of The University of Iowa and the Free Radical and Radiation Biology Program requires that international applicants achieve a score of 81 or higher on the Test of English as a Foreign Language (TOEFL iBT). Applicants will be given a waiver if they are a U.S. citizen, or have earned the equivalent of a U.S. Bachelor's degree from one of the countries listed here: https://grad.admissions.uiowa.edu/graduate-programs/english-requirements-admission-graduate-college. For newly admitted graduate students, the on-campus English Proficiency Evaluation (EPE) will be required unless you submit a TOEFL overall score of 100 or higher. English as a Second Language coursework (ESL) specified as a result of the English evaluation must be completed satisfactorily, typically within the first year of graduate study. Credits earned from English as a Second Language cannot be counted towards the M.S. or Ph.D. degree.

L. Graduation requirement deadlines (*https://www.grad.uiowa.edu/deadlines*)

Students must be registered for the session in which the degree (M.S. or Ph.D.) is to be conferred. Graduate College deadlines to be met include:

(a) Application for Degree;

(b) Plan of Study;
(c) Final Exam Request;
(d) Deposit of thesis.

These dates change each session and it is the **responsibility of the student** to discuss these with their advisor and check the Graduate College web page so that the deadlines are met.

M. Guideline changes

The faculty will change the Guidelines from time to time. It is the Free Radical and Radiation Biology Program policy that the student will use the version that is in place when they declare their degree objective. For most students, this will be the Guidelines in effect when they enter the program. For those who change their degree objective after entering the Program, the Guidelines that will be followed are those that are in place when the degree objective is changed.

Any exceptions to the Guidelines requested by a student, relative to the FRRBP Guidelines, need to be put in writing, submitted to the faculty, and then will be discussed and voted on by the faculty on a case by case basis.

N. Policy for changing subprograms in the Biomedical Science Graduate Program:

Introduction: In setting up the umbrella Biomedical Science Graduate Program, it was agreed that students would have the prerogative to change subprograms (as students may for any PhD program/subprogram at UI). It was agreed that such changes would be uncommon, not encouraged, but possible. Given the complexities of our Program and subprograms, and the important implications for funding, a formal set of policies for changing subprograms is outlined below.

A student wishing to change subprograms should follow the steps outlined below, in the sequence in which they are presented, as relevant. Note that the final step, completing a Request for Change of Graduate College Status form for Graduate Admissions, must be completed with approval and oversight from the Office of Graduate and Postdoctoral Studies (OGPS).

1. The student should have a discussion with the DGS/Director of the subprogram the student is proposing to leave. The student should have a clear, compelling rationale for the proposal to change subprograms. "Compelling rationale" could include a strong realization and conviction that the student prefers a different field of biomedical science or has convincing career opportunities in a different field of biomedical science. The student should obtain permission from the DGS/Director (of the subprogram the student is leaving) to change subprograms.

If such permission is not granted, and the student wishes to continue pursuing the request to change subprograms, the student's request will be evaluated by the subprogram's Executive Committee. The Executive Committee will render a decision. If the issue remains unresolved, the student's request will be evaluated by the CCOM Associate Dean of Graduate and Postdoctoral Studies, and a final decision will be rendered.

2. The student should have a discussion with the DGS/Director of the subprogram that the student is joining as well as obtain permission from that DGS/Director to join that subprogram.

If such permission is not granted, and the student wishes to continue pursuing the request to join that subprogram, the student's request will be taken up by the destination subprogram's Executive Committee. If the Executive Committee upholds the decision to not grant permission to the student to join the subprogram, the student will not be permitted to join that subprogram.

3. For students who are still in the first-year rotation phase of their training, the student should have a discussion with the relevant DGSs/Directors (the one for the subprogram the student is leaving and the one for the subprogram the student is joining) about what will be counted for lab rotations, what remains to be completed for lab rotations, and the optimal timing for the subprogram change.

In the case of first-year rotation students, there may be funding implications of changing subprograms – e.g., the slot allocation for the student/subprogram may be affected, the student may be on a training grant, etc. Such financial implications should be discussed amongst the relevant DGSs/Directors and the CCOM Associate Dean of Graduate and Postdoctoral Studies, and a consensus should be reached.

Note: The policies articulated herein for changing subprograms in the BSP are not meant to address or otherwise cover situations where students are having difficulty affiliating with a lab home. The responsibility for placing students in a lab home lies with the subprogram into which the student initially matriculated. Changing subprograms should not be used as a mechanism to solve lab placement problems. Subprograms have the prerogative to place students in labs of PIs outside the subprogram, with appropriate agreements, co-mentoring arrangements, and full understanding by all relevant parties (so-called "subcontracting"). Such placements need not require the student to change subprograms.

4. When relevant (for students who are already affiliated with a PI/lab), the student should obtain permission from the student's mentor. The student may be staying in the same lab with the same mentor, or may be changing mentors/labs. In either case, the student should inform all relevant parties and obtain permission from all relevant parties.

Per Office of Graduate and Postdoctoral Studies (OGPS) and Biomedical Science Program (BSP) policies, the DEO of the supervising faculty member is required to approve lab affiliations. If a change of subprograms implies a change of the responsible DEO, the new DEO should be informed of the change, give permission for the change (if the DEO in fact approves), and accept responsibility for financial backstopping of the student (per standard OGPS/BSP policy). As in #1 above, situations where relevant permissions are not granted should be taken to the Executive Committee of the relevant subprogram(s), and then to the CCOM Associate Dean of Graduate and Postdoctoral Studies if the matter remains unresolved.

5. The student should obtain permission and approval from the CCOM Associate Dean of Graduate and Postdoctoral Studies.

6. The student should obtain a "Request for Change of Graduate College Status" form from the Graduate Admissions Office (115 Calvin Hall). The form should be completed by the student, and then submitted to the OGPS office for approval. OGPS approval is required prior to submitting the form to the subprogram the student wishes to transfer into. The form may then be finalized and signed by the subprogram the student is transferring into, and then submitted to Graduate Admissions per instructions on the form.

IV. MASTER'S DEGREE (M.S.) PROGRAM

The Free Radical and Radiation Biology Graduate Program offers the M.S. degree with thesis. The specific requirements are listed below.

A. Entrance requirements

Students with the Bachelor's degree or equivalent and the proper background courses must have a 3.0 grade-point average (GPA) for admission to regular status. A student with the M.S. objective must maintain a grade-point of at least 3.0 on all graduate work completed at The University of Iowa.

B. Plan of Study

The student and temporary advisor should select courses for the first semester of study and develop a Plan of Study for the M.S. degree as soon as possible, but not later than the beginning of the second semester of enrollment. The student should learn of the research interests of the different faculty members and select a permanent advisor not later than the end of the second semester of enrollment in the Free Radical and Radiation Biology Program.

The Graduate College requires that an "applicant for a Master's degree must file a Plan of Study approved by the advisor and the departmental executive with the Graduate College within the session in which the degree is to be granted and by a date to be established by the Graduate College Dean".

C. Graduate College minimum requirements

Each candidate for the M.S. degree must satisfactorily complete at least 30 semester hours of graduate credit. The student must maintain a grade-point average of at least 3.0 on all graduate work completed at The University of Iowa. The Graduate College specifies (Section X-D., Manual of Rules and Regulations of the Graduate College) that "at least 24 semester hours must be completed under the auspices of The University of Iowa". English as a Second Language (ESL) courses do not count towards this requirement. All M.S. candidates must pass a M.S. Qualifying Exam and a M.S. Final Examination. The timing for these procedures is illustrated in Figure 1 (Appendix).

D. Specific course requirements

Each candidate must satisfactorily complete the three major courses offered in the Program. These courses are Radiation Biology FRRB:5000, Molecular and Cellular Biology of Cancer FRRB:7001, and Redox Biology and Medicine FRRB:7000. These three courses are offered in alternating years and the lectures are Panopto recorded so the content can be accessed off cycle for students in special circumstances. In addition, each candidate must satisfactorily complete Rigor & Reproducibility FRRB:5005, Cell Cycle Control MMED:6226, Principles of Molecular and Cellular Biology BMED:5207, and two 1-credit courses from Growth factor receptor signaling MMED:6225, Cell fate decisions MMED:6227, or Practical Bioinformatics BISC:5205. All of these courses must be taken for a letter grade. BMED 7270 (Fall) and BMED 7271 (Spring) - Scholarly Integrity/Responsible Conduct of Research 1 and 2. – *To meet compliance requirements you MUST TAKE BOTH courses, but the order does not matter. M.S. candidates must also complete Collaborative Instructional Training Initiative CITI GRAD:7270. A minimum of eight semester hours of Research FRRB:6004 credit and a written thesis

(Section IV-G.) are required for the M.S. degree with thesis. If a student has had the equivalent of a course elsewhere, either as a course or through work experience, the student may formally ask for the opportunity to take a by-pass exam, a course substitution, or an exemption (Section III-H.).

Except for new students enrolled for their first year, each candidate must register at least once a year in the Program Seminar FRRB:6000 and enroll for a minimum of one semester hour of credit in Current Topics in Free Radical Biology FRRB:6006, and Current Topics in Radiation and Cancer Biology FRRB:6008 and present one or more research papers. Performance in seminar courses will be evaluated with letter grades, but the Current Topics courses will be evaluated on an S/U basis. Attendance at other seminars and lectures outside the Free Radical and Radiation Biology Program is strongly encouraged.

Each fulltime student (students with a one-half time assistantship) must take at least 9 semester hours in the fall semester and again in the spring semester and 2 semester hours (optional, consult with advisor) of research in the Summer session until the M.S. Qualifying Examination is passed. After passing the M.S. Qualifying Examination, the student may after prior consultation with his/her advisor sign up for less than 9 credit hours per semester. Each student must take at least two (2) semester hours of Research every semester the student is in the Program. Any deviation from this rule requires special permission of the faculty. It should also be noted that credits earned from English as a Second Language (ESL) courses do not count towards the M.S. or Ph.D. degrees. Students may register for Master's Final Registration (000:001) during their final semester of study if all research has been completed. Students who are less than full time should negotiate their Plan of Study with the faculty.

E. Summary of M.S. degree course ***requirements***

Intramural Courses *Free Radical and Radiation Biology*

	Credits
Radiation Biology FRRB:5000	4
Rigor & Reproducibility in Redox and Radiation Biology FRRB:5005	1
Molecular and Cellular Biology Cancer FRRB:7001	3
Redox Biology & Medicine FRRB:7000	4
Free Radical Radiation Biology Seminar FRRB:6000	1
Current Topics in Free Radical Biology FRRB:6006	1
Current Topics in Radiation and Cancer Biology FRRB:6008	1
Research FRRB:6004	8
Sub-Total Semester Hours for Intramural Courses	23

Extramural Courses

Cell Cycle Control MMED:6226	1
Principles of Molecular and Cellular Biology BMED:5207	4
Cell Fate Decisions MMED:6227	1
BMED:7270 Scholarly Integrity/Responsible Conduct Research 1	0
BMED:7271 Scholarly Integrity/Responsible Conduct Research 2	0
Scholarly Integrity/Responsible Conduct of Research 1 and 2 Elective	4
Subtotal Semester Hours for Extramural Courses	10
Total Semester Hours for M.S. Degree	33

F. Plan of research study for M.S. degree

Between the first and second year of graduate study in consultation with the advisor (usually during the summer after the first two semesters), and no later than 1 month after the start of the third semester of study, the student (in conjunction with their advisor) will prepare and submit a written plan of research that will lead to the M.S. degree with thesis. The faculty will meet to review the plan of study and vote on the plan according to the following action:

1) satisfactory; proceed with research;
2) satisfactory with reservations; review required before proceeding with research; or
3) unsatisfactory.

The student will have two attempts at presenting an acceptable research plan to the faculty. If on the second attempt the student fails to present an acceptable plan, the student will be terminated from the graduate program. The time between the first and second attempt will be no greater than one month.

The research plan will consist of the following:

1. **Summary** (1/2 page)
   This section should state the broad and specific objectives of the investigation. The experimental design and methods to be used for meeting these goals should be concisely described. In addition, the potential significance of the possible results should be noted. This summary should "stand alone" as an accurate description of the work proposed.

2. **Specific Aims** (1/2 page)
   A concise statement of the hypothesis or hypotheses should be presented. The specific aims should be listed or stated in a few short sentences.

3. **Background and Significance** (3 pages)
   This section should critically evaluate the relevant scientific literature and summarize the current status of the concepts that relate to the research proposal. The potential contribution of the proposed research to obtaining key information missing from the literature or extending knowledge in the field should be described. The relevance of the potential findings to advances in the basic sciences, clinical practice, or to practical problems of society should be explained when possible. In the course of doing this, the importance of the research to the specific aims should be described.

4. **Preliminary Studies** (up to 2 pages including display items)
   This section is not required, but the candidate will benefit from describing with appropriate text, tables, and figures any preliminary results obtained. This section should describe what was done, why it was done, summarize the data obtained, and state what the findings may mean.

5. **Experimental Design and Methods** (3 pages)
   Outline the proposed experimental design and state the procedures that will be used to accomplish the specific aims of the project. Be explicit about methods for data collection, analysis, and interpretation. Defend the methods you propose to use and especially identify new methodology and its potential advantages, as well as potential limitations.

6. **Literature Cited** (no page limit)

G. M.S. Qualifying Examination

To qualify for entry into the M.S. Program in Free Radical and Radiation Biology, the student must satisfactorily complete a written qualifying examination. The student will usually take the exam after successfully completing the major required courses in the Free Radical and Radiation Biology Graduate Program, but no later than the beginning of the **fifth semester** after entering the Program. The exam will be offered after the close of spring semester classes on the first class day of the 8 week Summer session. A student shall have two attempts to satisfactorily complete the exam. If the first attempt is unsuccessful, the student may make another attempt no later than **four weeks** after the initial attempt. Students who do not satisfactorily complete the exam in these two attempts will be terminated from the Program (see Figure 1, Appendix).

The exam will be written on two consecutive mornings (four hours each) and cover concepts specific to the core curriculum of the Program. The general guidelines are that a score greater than 70% on any section constitutes a Ph.D. pass in that section; between 60% and 70% is an M.S. pass and below 60% a failing grade. A student who passes (Ph.D.-pass or M.S.-pass) some sections on the first attempt will not be required to repeat an exam for that section. New questions will be written for the exam sections to be repeated. An overall average of 70% or greater on the exam sections repeated constitutes a Ph.D.-pass. An average equal to or greater than 60% constitutes a M.S. pass and progress toward completion of M.S. degree requirements. (See Figure 1 in the Appendix.).

H. M.S. Final Examination

The Final Examination of the M.S. program of study is a defense of a thesis and explanation of the scientific principles involved. The student's M.S. research must be summarized in the format required by the Graduate College. One copy of the thesis must be submitted to the Graduate College for a preliminary check of the format at least four weeks before the graduation date at which the degree may be conferred (see The Graduate College "Thesis Manual", http://www.grad.uiowa.edu/theses-and-dissertations). Students should especially note that there is a final thesis deposit date set by the Graduate College for the anticipated semester of graduation. The completed M.S. thesis should be submitted to an examining committee at least two weeks before the final M.S. examination. The M.S. examining committee consists of at least three members of the graduate faculty approved by the Director of the Program after consultation with Program Faculty. At least two members of the M.S. committee shall be faculty members of the Free Radical and Radiation Biology Program. **Appendix II** provides the exact guidance from the Graduate College for selection and approval of committee members. This examination will be judged satisfactory or unsatisfactory with two or more negative votes making the examination unsatisfactory. If the examining committee so recommends, a candidate who fails may present himself/herself for reexamination, but not sooner than the next semester or Summer session. In accordance with Graduate College rules, the examination may be repeated only once.

If the student has declared his/her intention to seek admission to the Ph.D. Program in Free Radical and Radiation Biology, then the M.S. Committee should direct questions to the candidate such that the Ph.D. potential of the student can be assessed.

I. Eligibility for admission to Ph.D. degree program

The student may seek admission to the Ph.D. Program after successful completion of the M.S. degree in The University of Iowa Free Radical and Radiation Biology Program. The Program faculty will vote on the request of a student to enter the Ph.D. track. The decision will be based on course work, research accomplishments and aptitude, M.S. thesis quality, and evaluation of performance on the written qualifying examination. A quorum constitutes 3/4 of the Free Radical and Radiation Biology Program faculty (faculty can abstain). Majority vote will rule. In case of a tie vote, the student will be admitted to the Ph.D. program.

Admission does not guarantee financial support. Although the Free Radical and Radiation Biology Program is not obligated to provide financial support, support has usually been available for the students' entire graduate program.

V. DOCTOR OF PHILOSOPHY (Ph.D.) PROGRAM

Students may be accepted into the Ph.D. program in Free Radical and Radiation Biology by earning the M.S. degree with thesis in Free Radical and Radiation Biology at The University of Iowa and/or becoming Ph.D. eligible. Students who have earned a M.S. degree with a thesis in another science program at The University of Iowa or another accredited university may also be accepted into the Ph.D. program in Free Radical and Radiation Biology.

A. Entrance requirements

Students with the Bachelor's degree or equivalent and the proper background courses must have a 3.0 grade-point average (GPA) for admission. A student with the Ph.D. objective must maintain a GPA of at least 3.0 on all graduate work completed at The University of Iowa.

B. Plan of Study

The student and temporary advisor should select courses for the first semester of study and develop a Plan of Study for the Ph.D. degree as soon as possible, but not later than the beginning of the second semester of enrollment. The student should learn of the research interests of the different faculty members and select a permanent advisor not later than the end of the second semester of enrollment in the Free Radical and Radiation Biology Program. This is especially crucial for those who have already earned the M.S. degree at Iowa or elsewhere. The advisor may be, but need not be, the same as the M.S. program advisor.

C. Graduate College minimum requirements

Each candidate for the Ph.D. degree must satisfactorily complete at least 72 semester hours of graduate credit (including transfer credits and credits earned for the M.S. degree). The student must maintain a grade-point average of at least 3.0 on all graduate work completed at The University of Iowa. The Graduate College specifies (Section XII-C., Manual of Rules and Regulations of the Graduate College, 2000 edition) that “the candidate is expected to have completed at least three years of residence in a graduate college. At least part of this residence must be spent in full-time involvement in one’s discipline, at this University, beyond the first 24 semester hours of graduate work; this requirement can be met either by: (1) enrollment as a full-time student (9 semester hours minimum) in each of two semesters, or (2) enrollment for a minimum of 6 semester hours in each of three semesters during which the student holds at least a one-third-time assistantship certified by the department as contributing to the student’s doctoral program.” English as a Second Language (ESL) courses do not count towards this requirement. All Ph.D. candidates must pass a Ph.D. Comprehensive Examination and a Ph.D. thesis defense. The timing for these procedures is illustrated in Figure 2 (Appendix). The Comprehensive Exam and the Ph.D. thesis defense may not be taken in the same semester.

D. Specific course requirements

Each candidate for the Ph.D. in Free Radical and Radiation Biology must complete the three major courses offered regularly in the Program (Section V-E.). These courses are Radiation Biology FRRB:5000, Molecular and Cellular Biology of Cancer FRRB:7001, and Redox Biology and Medicine FRRB:7000. These three courses are offered in alternating years and the lectures are recorded so the content can be accessed off cycle for students in special circumstances. Students must also satisfactorily

complete Rigor & Reproducibility FRRB:5005, Basic Biostatistics & Experimental Design PCOL:5204 or equivalent, BIOC:7251 Introduction to Protein Structures, BIOC:7252 Enzymes, Carbohydrates, Nucleic Acids, and Bioenergetics, BIOC:7253Metabolism I, and Cell Cycle Control MMED:6227, Principles of Molecular and Cellular Biology (BMED:5207) and two 1-credit courses from Growth Factor Receptor Signaling MMED:6225, Cell Fate Decisions MMED:6227, Fundamentals of Protein Regulation BISC:5202, or Practical Bioinformatics BISC:5205. All of these courses must be taken for a letter grade. BMED 7270 (Fall) and BMED 7271 (Spring) - Scholarly Integrity/Responsible Conduct of Research 1 and 2. – *To meet compliance requirements you MUST TAKE BOTH courses but the order does not matter. Ph.D. candidates must also complete online Collaborative Instructional Training Initiative (CITI). A Ph.D. student must also take at least 11 hours of electives. The faculty, in consultation with the advisor, will decide whether the courses chosen are appropriate. Special topics FRRB:5001, Current Topics FRRB:6006 and FRRB:6008, and Research FRRB:6004 may be taken on an S/U basis. Current Topics in Radiation and Cancer Biology must be taken at least two (2) times and Current Topics in Free Radical Biology must also be taken two (2) times. Students in the Ph.D. program must enroll in the Seminar course FRRB:6000 and present a talk every year during the Ph.D. program of study, except the first year, for a minimum total of three semester hours. Presentation of papers at scientific meetings is encouraged, but not required.

Each fulltime student (students with a one-half time assistantship) must take at least 9 semester hours in the fall semester and again in the spring semester and 2 semester hours (optional, consult with advisor) of research in the Summer session until the Ph.D. comprehensive exam is passed. After passing the Ph.D. comprehensive examination, the student may after prior consultation with his/her advisor sign up for less than 9 semester hours per semester. Each student must take at least two (2) semester hours of Research every semester the student is in the Program. Any deviation from this rule requires special permission of the faculty. It should also be noted that credits earned from English as a second language (ESL) courses do not count towards the M.S. or Ph.D. degrees. Students may register for Post-comprehensive Registration (000:000) during their final semester of study if all research has been completed. Students who are less than full time should negotiate their Plan of Study with the faculty.

Redox and Radiation Biology 21

*E. Summary of Ph.D. degree course **requirements***

Intramural Courses

		Credits
Radiation Biology FRRB:5000		4
Rigor & Reproducibility in Redox and Radiation Biology FRRB:5005		1
Redox Biology & Medicine FRRB:7000		4
Molecular and Cellular Biology of Cancer FRRB:7001		3
Free Radical Radiation Biology Seminar FRRB:6000		3
Current Topics in Free Radical Biology FRRB:6006		2
Current Topics in Radiation and Cancer Biology FRRB:6008		2
Research (FRRB:6004)		33
Sub-Total Semester Hours for Intramural Courses		**52**

Extramural Courses

BIOC:7251	Introduction to Protein Structures	1
BIOC:7252	Enzymes, Carbohydrates, Nucleic Acids, and Bioenergetics	1
BIOC:7253	Metabolism I	1
Basics Biostatistics & Experimental Dsgn PCOL:5204		1
Cell Cycle Control MMED:6226		1
Principles of Molecular and Cellular Biology BMED:5207		3
BMED:7270 Scholarly Integrity/Responsible Conduct of Research 1		0
BMED:7271 Scholarly Integrity/Responsible Conduct of Research 2		0

Students must select two courses (***required***) from the following

Growth Factor Receptor Signaling MMED:6225		1
Cell Fate Decisions MMED:6227		1
Practical Bioinformatics BMED:5205		1

Electives often recommended (discuss with advisor) 11

Research (FRRB:6004)

BIOC:7254	Metabolism II	1
BIOC:7255	Metabolism III and Biosignaling	1
BIOC:7256	Molecular Biology	1
BIOL:3713	Molecular Genetics	4
ACB:4156	Scanning Electron Microscopy & X ray Microanalysis	3
ACB:5218	Electron Microscopy Techniques	3
MICR:3147	Survey of Immunology	4
MICR:2157	General Microbiology	5
MICR:6201	Immunology I	3
OEH:5710	Environmental Toxicology	3
PATH:5270	Pathogenesis of Major Human Diseases	3
PATH:8133	Introduction to Human Pathology	4
PATH:5260	Translational Histopathology	3
BIOC:3140	Experimental Biochemistry	4
MMED:6220	Cell Biology I	3

MMED:6225	Cell Biology II	3
MMED:6215	Transcription RNA	1
MMED:6220	Mechanisms of Cellular Organization	1
PSQF:6217	Seminar in College Teaching	3
Sub-Total Semester Hours for Extramural Courses		**21**
TOTAL Semester Hours for Ph.D. Degree		72[=][**]

F. Plan of research study for Ph.D. degree

Between the first and second year of graduate study, and no later than 1 month after the start of the third semester of study, the student (in consultation with their advisor) will prepare and submit a written plan of research that will lead to the Ph.D. degree with thesis. The faculty will meet to review the plan of study and vote on the plan according to the following action:

1) satisfactory; proceed with research;
2) satisfactory with reservations; review required before proceeding with research; or
3) unsatisfactory.

The student will have two attempts at presenting an acceptable research plan to the faculty. If on the second attempt the student fails to present an acceptable plan, the student will be terminated from the graduate program. The time between the first and second attempt will be no greater than one month.

The research plan will consist of the following:

1. **Summary** (1/2 page)
   This section should state the broad and specific objectives of the investigation. The experimental design and methods to be used for meeting these goals should be concisely described. In addition, the potential significance of the possible results should be noted. This summary should "stand alone" as an accurate description of the work proposed.

2. **Specific Aims** (1/2 page)
   A concise statement of the hypothesis or hypotheses should be presented. The specific aims should be listed or stated in a few short sentences.

3. **Background and Significance** (3 pages)
   This section should critically evaluate the relevant scientific literature and summarize the current status of the concepts that relate to the research proposal. The potential contribution of the proposed research to obtaining key information missing from the literature or extending knowledge in the field should be described. The relevance of the potential findings to advances in the basic sciences, clinical practice, or to practical problems of society should be explained when possible. In the course of doing this, the importance of the research to the specific aims should be described.

[=] Seminar must be taken at least once a year after the first year, so the number of semester hours will vary depending on how long the student is enrolled. A minimum of 3 seminar semester hours is necessary.

[**] Note, the minimum requirement of the Graduate College for the Ph.D. degree is **72 semester hours**. Students should enroll in Research, and Electives to bring their total semester hours to at least 72 to complete the Plan of Study.

4. **Preliminary Studies** (up to 2 pages including illustrations)

This section is not required, but the candidate will benefit from describing with appropriate text, tables, and figures any preliminary results obtained. This section should describe what was done, why it was done, summarize the data obtained, and state what the findings may mean.

5. **Experimental Design and Methods** (3 pages)

Outline the proposed experimental design and state the procedures that will be used to accomplish the specific aims of the project. Be explicit about methods for data collection, analysis, and interpretation. Defend the methods you propose to use and especially identify new methodology and its potential advantages, as well as potential limitations.

6. **Literature Cited** (no page limit)

G. Student Teaching

All Ph.D. candidates are encouraged to assist in the teaching of at least one of the major courses offered in the Free Radical and Radiation Biology Program. Molecular & Cellular Biology of Cancer FRRB:7001, Radiation Biology FRRB:5000, and Redox Biology & Medicine FRRB:7000. Radiation Safety & Radiobiology FRRB:3130.
MMED Course, Inflammation Cell Signaling & Targeting Cancer Therapy MMED:6240.
There is no formal teaching requirement.

H. Ph.D. Qualifying Examination

To qualify for entry into the Ph.D. Program in Free Radical and Radiation Biology, the student must satisfactorily complete a written qualifying examination. The student will usually take the exam after successfully completing the major required courses in the Free Radical and Radiation Biology Graduate Program, but no later than the beginning of the **fifth semester** after entering the Program. The exam will be offered after the close of spring semester classes, typically Monday and Tuesday of the first week of the regular summer session. A student shall have two attempts to satisfactorily complete the exam. If the first attempt is unsuccessful, the student may make another attempt no later than **four weeks** after the initial attempt. Students who do not satisfactorily complete the exam in these two attempts will be terminated from the Program (see Figure 2, Appendix).

The exam will be written on two consecutive mornings (four hours each) and cover concepts specific to the core curriculum of the Program. The general guidelines are that a score greater than 70% on any section constitutes a Ph.D. pass in that section; between 60% and 70% is an M.S. pass and below 60% a failing grade. A student who passes (Ph.D. pass) some sections on the first attempt will not be required to repeat an exam for that section. New questions will be written for the exam sections to be repeated and students are expected clear 70% pass within eight weeks of their first attempt. An overall average of 70% or greater on the exam sections repeated constitutes a Ph.D. pass. An average equal to or greater than 70% constitutes a Ph.D. pass and progress toward completion of the Ph.D. degree requirements. (See Figure 2 in Appendix).

I. Ph.D. Comprehensive Examination

Ph.D. candidates must successfully pass the Ph.D. Comprehensive Examination. This examination may be taken at any time after successfully completing the qualifying exam but no later than **the first February after successfully completing the qualifying exam**. If a student fails to satisfactorily complete the comprehensive exam, the student will be allowed one additional attempt to satisfactorily complete the exam. The second attempt must be taken within 2 months of the first exam. Students who fail the exam on two successive occasions will be terminated from the Ph.D. program but may qualify for the M.S. degree (see Figures 1 and 2, Appendix).

For the Ph.D. comprehensive examination, the student must develop, present, and defend the research proposal (Section V-J.) that will be used for their Ph.D. research and which demonstrates the student's familiarity with relevant scientific literature, laboratory methods available, and ability to design a series of experiments and interpret the results. Two unsatisfactory votes on the comprehensive examination make the committee report unsatisfactory. With the consent of the committee, this examination may be repeated once. The second examination should be taken within four months from the date of the first exam. A revised version of the original proposal may be presented for evaluation. As noted earlier, a Plan of Study must accompany the request for the Ph.D. Comprehensive Examination.

The examining committee will consist of at least five faculty members recommended by the faculty advisor and the student, approved by the Program Faculty. **Appendix II** provides the exact guidance from the Graduate College for selection and approval of committee members. The same committee that approves the student's proposal will usually (but not necessarily) serve as the committee for the final defense of the Ph.D. dissertation.

The students must have their specific aims approved by each member of their committee prior to writing their complete comps exam. Students are expected to get detailed feedback from individual committee members. After the aims are approved, students can no longer have input on their proposal from committee members until the day of the comprehensive exam. The committee will evaluate the student's proposal and the presentation as satisfactory, reservations, or unsatisfactory. If two or more votes are "unsatisfactory", the committee may agree that the student can repeat the examination one additional time. If one or more votes are "reservations" the conditions for removing the reservations shall be stipulated in the report to the Graduate College by the chair of the committee.

J. Research proposal for Ph.D. degree

For the Ph.D. comprehensive examination (Section V-I), the student must develop a proposal, present a written copy of the proposal to each member of the examining committee, then orally defend the proposal two to four weeks later. This research proposal will be based on the research project the student has selected for his/her Ph.D. research. The written proposal shall be prepared using a computer, be no more than one-page Specific Aims and twelve pages Experimental Approach. (all single spaced pages), and follow the general guidelines for National Institutes of Health (NIH) R01 research grant proposals (minus administrative pages) (See instructions that are provided in the NIH publication PHS-398, available from the NIH web site). In addition, the structural format of the proposal should be discussed thoroughly with the student’s advisor and other faculty, as appropriate.

The proposal should consist of the following:

1. **Summary** (up to 1 page)

This section should state the broad and specific objectives of the investigation. The experimental design and methods to be used for meeting these goals should be concisely described. In addition, the potential significance of the possible results should be noted. This summary should "stand alone" as an accurate description of the work proposed.

2. **Specific Aims** (1- single spaced page)

A concise statement of the hypothesis should be presented. The specific aims should be listed or stated in a few short sentences. After each specific aim or at the end of the list (if more appropriate), explain how accomplishment of these specific aim(s) will contribute to proper testing of the proposed hypothesis.

3. **Experimental Approach Consisting of (**12 single-spaced pages**)**

A. **Significance and Innovation** (1 single-spaced page Maximum)

B. **Background and Preliminary Studies** (2 - 5 pages)

This section should critically evaluate the relevant scientific literature and summarize the current status of the concepts that relate to the research proposal. The potential contribution of the proposed research to obtaining key information missing from the literature or extending knowledge in the field should be described. The relevance of the potential findings to advances in the basic sciences, clinical practice, or to public health concerns, should be explained when possible. In the course of doing this, the importance of the research to the specific aims should be described. Preliminary studies are not required but the candidate will benefit from describing with appropriate text, tables, and figures any preliminary results obtained justifying the experimental approaches. This section should describe what was done, why it was done, summarize the data obtained, and state what the findings may mean.

C. **Experimental Design and Methods** (6-9 pages)

Outline the proposed experimental design and state the procedures that will be used to accomplish the specific aims of the project. Be explicit about methods for data collection, analysis, and interpretation. Defend the methods you propose to use and especially identify new methodology and its potential advantages, as well as its limitations. Include "Alternative Approaches" for each Aim.

6. **Literature Cited** (no page limit)

Time Line Note the order in which experiments will be done and the alternative approaches (alternative approaches should be included in section C for each Aim) that may be taken. Estimate the time it may take to complete each phase of the investigation. This will help the candidate and the Comprehensive Exam Committee determine whether the various approaches suggested are feasible.

In both the written research proposal and the oral defense of the proposal, the student should be able to demonstrate an in-depth understanding of the scientific principles that relate to the proposal. Your PhD committee members will be reviewing your comprehensive exam as if they were NIH reviewers. Audiovisual aids, *e.g*. slides or transparencies, may be used by the student for the oral defense of the proposal.

K. Ph.D. Final Examination

The final examination of the Ph.D. program of study is a defense of a thesis and explanation of the scientific principles involved. The student's Ph.D. research must be summarized in the format required by the Graduate College (see The Graduate College "Thesis Manual" http://www.grad.uiowa.edu/theses-and-dissertations). Students should especially note that there is a thesis deposit date set by the Graduate College for the anticipated semester of graduation. The completed Ph.D. thesis should be given to each member of the examining committee at least two weeks before the final examination and four weeks before the deposit of the thesis in the Office of the Graduate College. The final examining committee must consist of no fewer than five members of the graduate faculty recommended by the faculty of the Program to the Director of the Free Radical and Radiation Biology Program and approved by the Dean of the Graduate College. This committee need not be the same as the Ph.D. comprehensive examination committee, but at least three members shall be from the Free Radical and Radiation Biology Program. One member of the final examination committee must be from a department outside Radiation Oncology. We require that four of your University of Iowa committee members be **Tenured** or on the **Tenure** track. On occasion, a scientist with appropriate expertise from outside of The University of Iowa will be recommended to the Dean of the Graduate College to serve on the committee. The examination will be judged satisfactory or unsatisfactory. Two unsatisfactory votes make the report of the committee unsatisfactory. The candidate may not present for reexamination sooner than the next semester. In accordance with Graduate College rules, the examination may be repeated only once.

Before the Ph.D. degree is recommended by the Free Radical and Radiation Biology Graduate Program and granted by the Graduate College, the candidate must:

1) submit at least one manuscript (or ready to submit) to a peer-reviewed journal, and
2) deposit two complete copies of the thesis with the advisor.
3) provide an electronic copy of the thesis to the FRRBP.

L. Disclaimer

Considerable effort has been invested by the faculty and staff to make this document an accurate description of the Free Radical and Radiation Biology Graduate Program, especially the requirements for successful completion of this graduate program. However, because of continued evolution in course offerings, Graduate College requirements, and graduate study in general, there may be adjustments that need to be made to meet the changes in the landscape of a student's graduate program. Any needed changes will be made in a manner that will not impede a student's progress, yet meet the philosophy and goals of the degree objective.

Appendices I and II follow.

VI. APPENDIX I

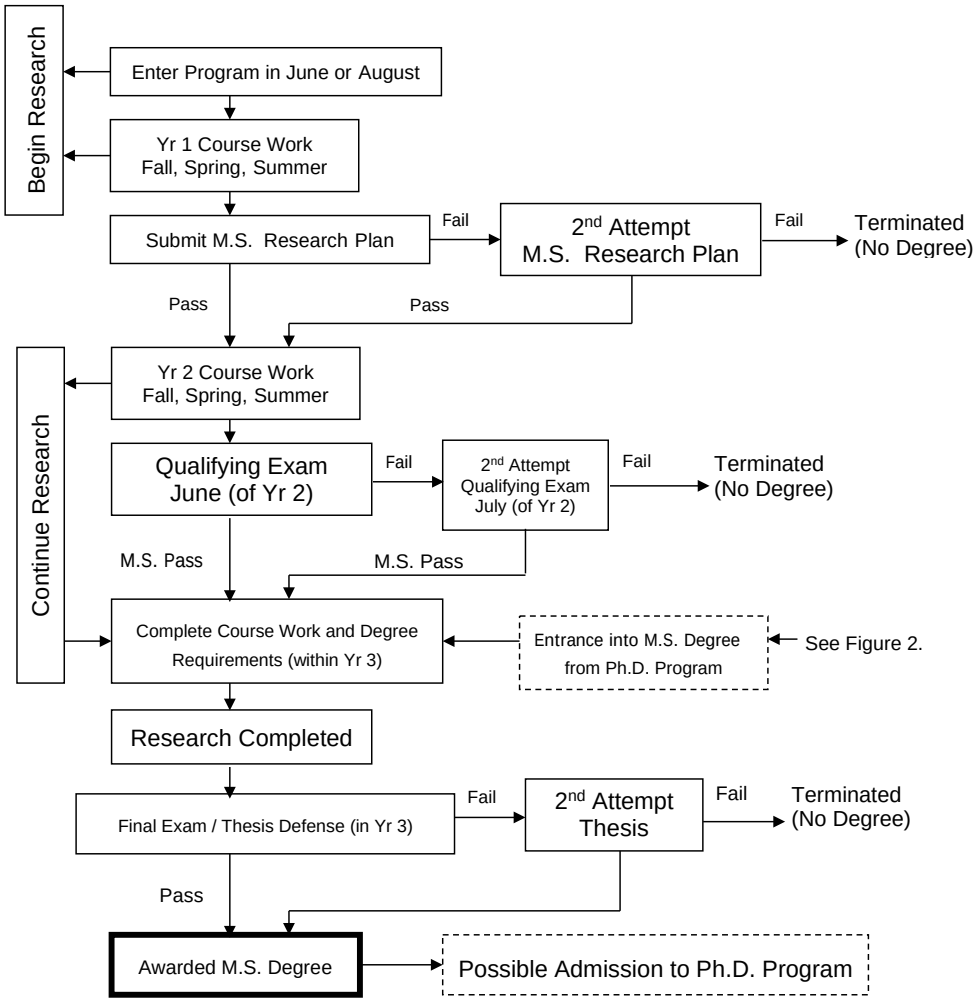

Figure 1. Flow Chart for a M.S. Degree with Thesis

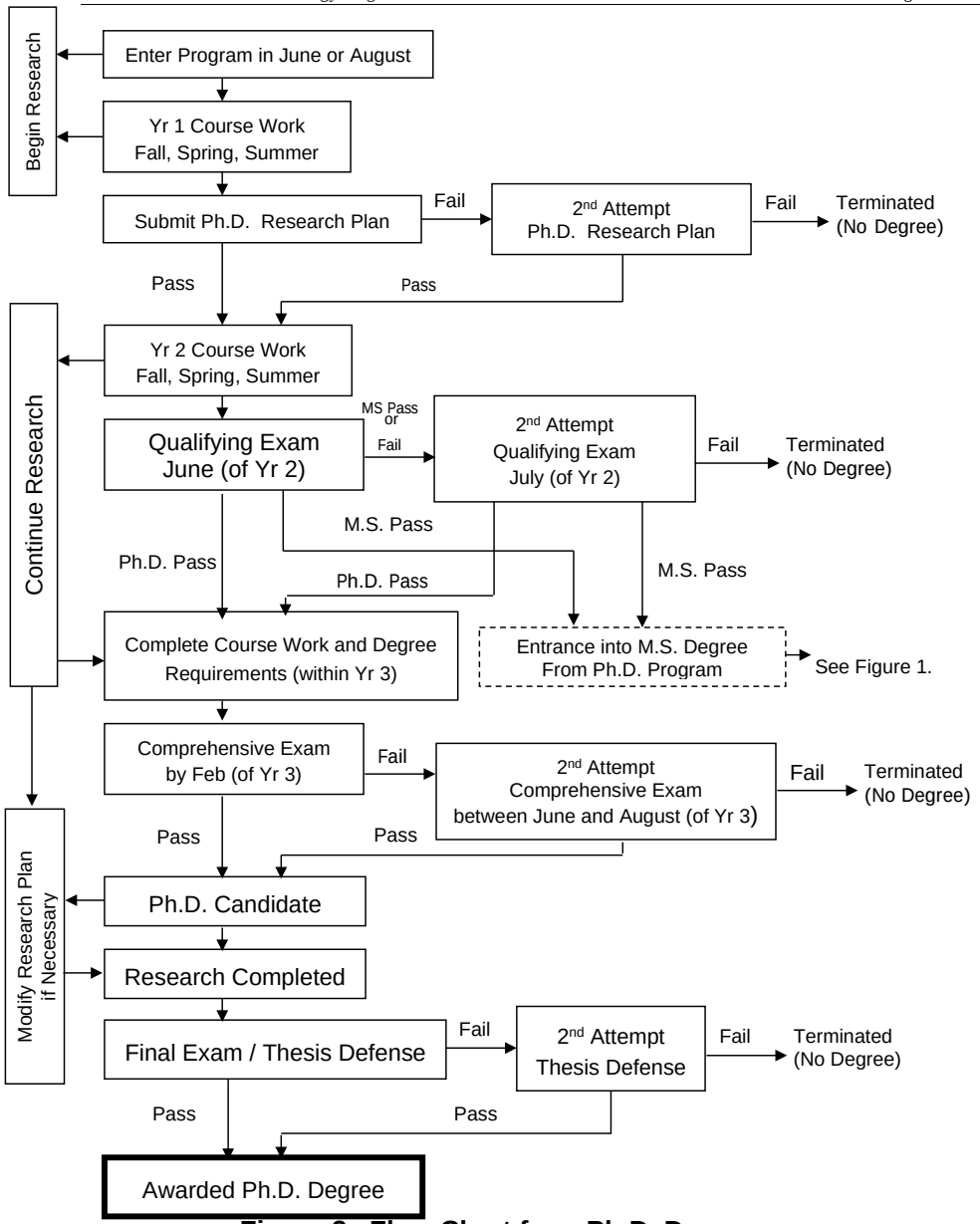

Figure 2. Flow Chart for a Ph.D. Degree

Appendix II. Examination Committees

COMMITTEE SERVICE FAQ

Determining When to Seek Approval

Is this person currently a tenure-track faculty member at Iowa, or were they tenure track less than 1yr ago?

If YES

You do not need to submit anything.

- They are automatically eligible for committee service. They also count as "tenure-track" toward the total 4 required.

If NO

Please submit an **approval request letter** and **CV**.

- If they are in emeritus status (for > 1-yr), or non-emeritus, they will be given a renewable, 3-yr term.

	Doctoral	Non-Doctoral
Committee Make-Up	--5 members minimum --4 tenure-track, Iowa faculty members --2 Iowa faculty in the student's field of study	--3 members minimum --2 tenure-track, Iowa faculty members --2 Iowa faculty in the student's field of study
Skype/Remote Members	--Only 1 committee member may be remote (remote participation approved by Grad College) --The chair may NOT be remote --Chair will sign for the remote committee member, with their own initials next to the remote member's signature on the Report document --The "vote" of the remote member should be confirmed via email sent to committee chair, with CC to Anne Sparks in the Graduate College	
Emeritus Faculty	--Emeritus faculty may not be the sole chair of a committee after 1-yr of emeritus status --If an emeritus faculty was on the comp committee while an active faculty member, they are "grandfathered" onto the final committee	
Comp Exam to Final Exam	--If member had to seek approval to be on the comp exam, they must still follow the 3-yr renewing policy to serve on the final committee; they are not "grandfathered" in.	

End of Document