

# MSBS IN CANCER BIOLOGY

The MSBS Qualifying Exam is taken in the summer term of the first year. Prior to completing the exam, students should carry out their thesis research under the course Research in CABP 6730. After passing the Qualifying Exam, students conduct their research under the course Thesis Research (CABP 6990). The minimum number of credits required for MSBS is 40, with a minimum of 25 credits of didactic coursework (letter grade), and a minimum of 10 credits of thesis research. The rest of the credits are approved electives and research in the Cancer Biology track.

All Masters students are also required to present posters in the annual UTHSC Graduate Student Research Forum and oral presentations in the annual Larry Gentry Research Symposia beginning in their second year.

## Admissions requirements:

- An earned degree: Baccalaureate (e.g., B.S., B.A.) granted by an accredited college or university
- GPA: A 3.0 GPA (on a 4.0 scale) or higher from the institution granting the baccalaureate or graduate degree.
- Coursework: Prior coursework should at least have some relevance to graduate studies in cell and cancer biology, including courses in biology, biochemistry, cell and molecular biology, physiology, statistics, genetics, etc.
- Letters of recommendation: Three or more letters of recommendation are required. Recommendation letters must be signed by the letter writer and full contact information for the letter writer must be provided. The letter should highlight the professional relationship between the applicant and the letter writer, the applicant's work ethic, previous research experience and/or academic preparations, and the intellectual contributions to the research project, if applicable.
- Statement of purpose: Applicants are required to provide a Statement of Purpose, which highlights academic and research training prior to application, CCB faculty and projects that are of particular interest, and future career goals.
- Resume/CV: Applicants are required to submit a resume/curriculum vitae
- TOEFL (or IELTS) is required for all international students. The following exceptions apply:
  - a. Proof of citizenship from one of these countries. (<https://www.utoledo.edu/graduate/admission/requirements/english-test-exempt.html>)
  - b. Successful completion of a U.S. Bachelor's or Master's degree.
  - c. Successful completion of at least 24 credit hours of academic study at a U.S. college or university.

Please note that students accepted into our program MUST find a mentor before or immediately after they matriculate. However, students still can undergo laboratory rotations (5-wks) during their first year for opportunities for professional development. Switching mentors can be done but is not encouraged.

Excitingly, if you are an outstanding applicant, you are eligible to compete for University Fellowships after being admitted to our program. Please click search now (<http://www.utoledo.edu/financialaid/scholarships/>

[search/?utm\\_source=programs&utm\\_campaign=scholarship](http://www.utoledo.edu/graduate/scholarships/)) for more information. Applications generally open in October and close at the beginning of March. <https://www.utoledo.edu/graduate/scholarships/> (<https://www.utoledo.edu/graduate/scholarships/>)

The mentor, who agreed to have you as a trainee is required to propose and initiate the evaluation and admission process to the CCB graduate Admissions Committee. The Committee will further carefully consider the applicant's GPA, college/university where previous degrees were awarded, previous coursework, letters of recommendation, previous research experience, publications/presentations (if applicable), statement of purpose, and resume/CV for the final decision.

## Advanced Courses in the Cancer Biology Track

### Advanced Cancer Biology

A comprehensive examination of the cellular and molecular foundation of cancer. Topics to be covered include: neoplasia; epidemiology and etiology; the role of causative agents such as chemicals, radiation, and viruses; cell proliferation, injury, and death; oncogenes; tumor suppressor genes; cancer therapies, and overviews of several major types of cancer.

### Readings in Cancer Biology

A readings and discussion course that will examine classic and current research publications from within the broad realm of cancer biology.

### Independent Study in Cancer Biology

In-depth study of research areas chosen by individual faculty. Examples of such topics may be: drug therapy and resistance, hormonal carcinogenesis, and epigenetic mechanisms of oncogenesis

Code	Title	Hours
BMSP 6330	Current Problems and Research Approaches in Proteins	2
BMSP 6340	Curr Prob Res App Genes/Genom	2
BMSP 6360	Current Problems and Research Approaches in Cell Membranes	2
BMSP 6380	Methods in Biomedical Sciences	2
BMSP 6390	Mentored Research	2
BMSP 6470	System Pathophysiology	4
BMSP 6350	Cell Biology & Signaling	3
CABP 6730	Research in Cancer Biology	4
BMSP 5320	Statistical Methods I	3
INDI 6020	On Being a Scientist	1
CABP 6270	Advanced Cancer Biology	3
CABP 6560	Readings in Cancer Biology (take twice)	2
CABP 6990	Thesis Research in Cancer Biol	12
<b>Total Hours</b>		<b>42</b>

First Term	Hours
Introduction to Biomedical Research	0
BMSP 6330 Current Problems and Research Approaches in Proteins	2
BMSP 6340 Curr Prob Res App Genes/Genom	2
BMSP 6360 Current Problems and Research Approaches in Cell Membranes	2
BMSP 6380 Methods in Biomedical Sciences	2

BMSP 6390	Mentored Research	1
<b>Hours</b>		<b>9</b>
<b>Second Term</b>		
BMSP 6470	System Pathophysiology	4
BMSP 6350	Cell Biology & Signaling	3
BMSP 6390	Mentored Research	1
CABP 6560 or CABP 8560	Readings in Cancer Biology or Readings in Cancer Biology	1
<b>Hours</b>		<b>9</b>
<b>Third Term</b>		
BMSP 5320	Statistical Methods I	3
INDI 6020	On Being a Scientist	1
CABP 6730	Research in Cancer Biology	2
Qualifying Examination must be completed by end of summer semester, which consists of 20 questions taken from a '100 question cancer biology bank' that was given to you at the start of your first semester.		
<b>Hours</b>		<b>6</b>
<b>Fourth Term</b>		
CABP 6560 or CABP 8560	Readings in Cancer Biology or Readings in Cancer Biology	1
CABP 6270	Advanced Cancer Biology (elective, can also take this course in third year)	3
CABP 6990	Thesis Research in Cancer Biol	2
or Electives		
<b>Hours</b>		<b>6</b>
<b>Fifth Term</b>		
CABP 6990	Thesis Research in Cancer Biol	10
Electives		
<b>Hours</b>		<b>10</b>
<b>Sixth Term</b>		
CABP 6990	Thesis Research in Cancer Biol (if required)	1
<b>Hours</b>		<b>1</b>
<b>Seventh Term</b>		
CABP 6990	Thesis Research in Cancer Biol (if required)	1
<b>Hours</b>		<b>1</b>
<b>Total Hours</b>		<b>42</b>

Prior to successfully completing the Qualifying Exam by end of 1st summer, students should conduct their thesis research under the course Research in CABP 6730. After passing the Qualifying Exam, students should conduct their research under the course Research in CABP 6990.

The minimum number of credits required for MSBS is 42 total, with a minimum of 20 didactic coursework (letter grade) and a minimum of 10 credits of thesis research. The rest of the credits are approved electives and research in the Cancer Biology track.

- PLO 1. FY1. Identify and summarize the general structure and function of cells, tissues, and organs

- PLO 2. FY2. Describe the common molecular, biochemical, and cellular mechanisms that maintain the normal function, development, and plasticity of cells, tissues, and organs
- PLO 3. FY3. Comprehend and critically evaluate relevant basic science and clinical literature with some guidance and help.
- PLO 4. FY4. Design and conduct applicable biomedical sciences experiments with guidance and help
- PLO 5. FY5. Organize, interpret, and summarize results of applicable biomedical sciences experiments with guidance and help
- PLO 6. FY6. Demonstrate ethical and responsible conduct in research and all other scholarly activities consistent with the University of Toledo, Health Science Campus, Standards of Conduct
- PLO 7. K1 Basic knowledge of molecular, biochemical, and cellular mechanisms important in maintaining the body's homeostasis.
- PLO 8. K2 Basic knowledge of the molecular mechanisms of oncogenic transformation from initiation of cells through tumor metastasis.
- PLO 9. K3 Basic knowledge of the pathophysiology of prominent types of cancer.
- PLO 10. K4 Basic knowledge of basic statistical methods used in the design and interpretation of his/her research projects.
- PLO 11. K5 Basic knowledge of the principles and legal responsibilities that govern responsible conduct of research, the ethical care and use of animals in research, and the accurate reporting of research results.
- PLO 12. S1 The ability to perform laboratory procedures necessary for the completion of the student's thesis (M.S.) research project(s).
- PLO 13. S2 The ability to design and complete a research project with some guidance and help.
- PLO 14. S3 The ability to perform research productively as an individual or member of a research team with some guidance and help.
- PLO 15. S4 The ability to communicate research findings effectively, both orally and in writing with some guidance and help
- PLO 16. S5 The ability to retrieve (from electronic databases and other sources), manage, and utilize biomedical information for solving problems that are relevant to the appropriate completion of a research project, and accurate reporting of the results under some guidance and help
- PLO 17. P1 Ethical, responsible, and reliable behavior in all aspects of their professional lives.
- PLO 18. P2 Honesty and integrity in all interactions with colleagues, research subjects, and others with whom students may interact in their professional lives.
- PLO 19. P3 Professionalism in dress and grooming in compliance with health and safety rules applicable to research laboratories and to other institutional and public sites.
- PLO 20. P4 Respect and adherence to all laws and regulations governing the biomedical research use of animals and patient materials, and for all patient privacy issues.