all signatures. This information must be provided at least 1 month prior to the beginning of the student's absence. If for any reason the research leave of absence extends beyond the limit originally reported, it is the responsibility of both the mentor and the student to inform the DGS and the graduate school of this change.

What follows are the specific expectations for each emphasis area that go beyond the above general guidelines.

Graduate Program in Biochemistry and Cancer Biology

ADMISSION OF STUDENTS TO THE PROGRAM IN BIOCHEMISTRY AND CANCER BIOLOGY:

In addition to the requirements of the Graduate School, participants in the Graduate Program in Biochemistry and Cancer Biology are recommended to also have taken the following undergraduate courses:

- General Chemistry, one year
- Analytical Chemistry, one semester
- Organic Chemistry, one year
- Physical Chemistry, one year
- Physics, one year
- Biology, two years
- Mathematics through Integral Calculus

Course Requirements for the Program in Biochemistry and Cancer Biology

DR: Departmental Required Course
DE: Departmental Elective Course

First Year: Core Curriculum

Second Year:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Cancer Biology I (DR)	3
	Membrane Biochemistry (DR)	3
	Biochemical Basis of Human Disease (DR)	3
	Directed Studies in Cytokines (DR)	2
	Advanced Topics in Biochemistry (DR)	3
	Directed Studies [Faculty] (DE)	1- 3
	Research (DR)	4-12
	Seminar Course (DR)	1
Spring Semester		
	Molecular Genetics (DR)	3

	Metabolic and Cellular Regulation (DR)	3
	Research (DR)	4-12
	Seminar Course (DR)	1
	Directed Studies – Cancer Biology II (DE)	2
	Radiation Biology (DE) Vanderbilt Grad. School	2
	Molecular Bioimaging (DE) Vanderbilt Grad. School	3
	Advanced Cell Signaling (DE)	3
	Other Elective Courses (MMC or Vanderbilt)	varies
Summer Semester		
	Research (DR)	6

Third Year:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Research (DR)	4-12
	Preparation of PhD Candidacy Proposal	
	Seminar	1
Spring Semester		
	Research	4-12
	PhD Candidacy Exam	
	Seminar	1
Summer Semester		
	Research (DR)	6
	PhD Candidacy Exam	

Subsequent Years:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Research (DR)	4-12
	Seminar	1
Spring Semester		
	Research	4-12
	Seminar	1
Summer Semester		
	Research (DR)	6

Total Required Hours: At least 40 credit hours of didactic courses

Core Curriculum: 26 credit hours

Biochemistry and Cancer Biology Required Courses: 20 credit hours

Elective Courses: As recommended by student's COI

Expected Graduation: 5 – 6 years

COURSE DESCRIPTIONS FOR THE PROGRAM IN BIOCHEMISTRY AND CANCER BIOLOGY

BICH 703. MOLECULAR GENETICS (SPRING)
An advanced course on the biochemistry and molecular genetics of gene expression, gene regulation and mutation. Current advances in prokaryotic and eukaryotic systems are discussed. 3 credit hours. Prerequisite: Core Curriculum.

BICH 706. MEMBRANE BIOCHEMISTRY (FALL)
This course discusses basic and contemporary literature on the structure and functions of biological membranes and includes topics on membrane dynamics, biogenesis and transport by or through membrane components. The cytoskeleton and the extracellular matrix are also discussed. 3 credit hours. Prerequisite: Background in cell physiology and/or molecular biology.

BICH 710. SEMINAR IN BIOCHEMISTRY AND CANCER BIOLOGY (FALL & SPRING)
Discussion of contemporary topics in cancer biology, carcinogenesis, biochemistry, cell and molecular biology. 1 credit hour.

BICH 712. DIRECTED STUDIES (Faculty) (FALL & SPRING)
Individual instruction designed to meet the specific academic needs of the student. This course may be research or didactic instruction. Up to 3 credit hours. Prerequisite: Consent of the instructor. The grade awarded in this course is S or U if a research course.

BICH 713. ADVANCED CELL SIGNALING (SPRING)
A lecture course covering specialized and contemporary areas of inquiry in cell signaling and molecular biology, consisting of one of three such areas per semester. This course may be taken more than once. 3 credit hours. Prerequisite: Consent of the instructor.

BICH 704. TOPICS IN CELLULAR AND METABOLIC REGULATION (SPRING)
An advanced course on the regulatory mechanisms controlling major metabolic and cellular physiological processes in eukaryotes. 3 credit hours.

BICH 730. CANCER BIOLOGY I (FALL)
A multidisciplinary course designed to expose students to the latest and promising areas of basic and translational research. Molecular mechanisms underlying carcinogenesis and tumor progression and their relationship to clinical aspects of the disease are discussed. Students will be

required to take a Keystone course in the pathobiology of cancer as an additional requirement for the course. 3 credit hours. Prerequisite: Consent of the instructor.

SELECTED TOPICS IN MOLECULAR VIROLOGY GENE THERAPY AND TRANSGENICS. Cross-listed in Microbiology and Immunology
MECHANISMS OF CANCER THERAPEUTICS. Cross-listed in Pharmacology

CANB 344. INTEGRATED BIOLOGY OF CANCER (VUMC) (SPRING)

BICH 769. MOLECULAR BIOIMAGING (VUMC) (SPRING)

SPECIAL PROGRAMMATIC FEATURES OF THE GRADAUTE PROGRAM IN CANCER BIOLOGY

Cancer Biology Retreat. Preceptors and trainees in the Cancer Biology program participate in the annual Cancer Biology Retreat hosted jointly by Meharry Medical College and the Vanderbilt Ingram Cancer Center. This is an outstanding opportunity to learn of advances in cancer research from bench to bedside to behavioral research and community-based research. Participants also have the opportunity to obtain constructive feedback from a broad audience on each individual's research program.

Graduate Program in Microbiology and Immunology

COURSE REQUIREMENTS FOR THE PROGRAM in MICROBIOLOGY AND IMMUNOLOGY

DR: Departmental Required Course
DE: Departmental Elective Course

First Year: Core Curriculum

Second Year:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Foundations in Research (DR)	3
	Fundamentals in Immunology (DR)	2
	Seminal Papers on the Foundations of Modern Microbiology (DR)	2
	Seminars/Journal Club (DR)	1
	Dissertation Research(DR)	1-12
	General Electives (DE)	
Spring Semester		
	Roles of Microorganisms in the	2