

# Department of Biomedical Sciences

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**Chairperson: John R. Mantsch, Ph.D.**

Department of Biomedical Sciences website (<http://www.marquette.edu/chs/bisc>)

The Marquette University Department of Biomedical Sciences offers a Biomedical Sciences major and minor area of study for undergraduate students interested in pursuing clinical and non-clinical careers in health care and related fields and offers graduate courses for the Interdisciplinary Neuroscience Graduate Program. In addition, the department offers accelerated direct admission entry into the Doctor of Physical Therapy, Doctor of Dental Surgery, and JD (Juris Doctor/Doctor of Law) programs, as well as an early admission opportunity to the Physician Assistant Studies program and Master of Business Administration (MBA) program at Marquette University as well as the PharmD program at the Medical College of Wisconsin. Lastly, for students who demonstrate exceptional work in the areas of research and community engagement as well maintain high academic standards, the department offers the opportunity to receive Disciplinary Honors in Biomedical Sciences.

The primary purpose of the major and minor is to provide a concentration of human- and medically-oriented courses in areas such as anatomical sciences, biochemistry, neuroscience, microbiology, molecular biology, pathology, pharmacology and physiology. The curriculum provides students with the opportunity to acquire the concepts, principles, facts, and terminology fundamental to all health care professions and related fields.

## Direct Admit Physical Therapy

Partnering with the Physical Therapy program at Marquette University, the Biomedical Sciences department offers an accelerated option for the Direct Admit Physical Therapy program, allowing students to complete their undergraduate degree within the first year of the professional phase of the program. Students who are admitted directly to the Physical Therapy program or those admitted following their junior year (space permitting) must meet the academic standards set by the Physical Therapy Department to continue within the program. Students who do not meet the academic requirements work with their advisers to complete the standard Biomedical Sciences major.

## Pre-medical and Pre-Dental studies

The Biomedical Sciences major at Marquette is powerful preparation for students planning to pursue careers in medicine or dentistry. The opportunity to study distinctively human, medical science-related courses at the undergraduate level is exceedingly rare. In addition, courses in the curriculum are taught by faculty scientists, many of whom also teach in Marquette School of Dentistry. Students in this program pursue course work in the anatomical sciences (including gross anatomy), biochemistry, and physiology, all taught from a clinical, human perspective. The course work provides students with the opportunity to acquire the concepts, principals, facts and terminology fundamental to medicine, and indeed, all healthcare professions and related fields. In addition, the wide range of course options in the major allows students to develop degree plans that matches their areas of interest, such as, neuroscience, head and neck anatomy, public health, genetics, microbiology, pharmacology, research, etc. The program boasts exceptionally high acceptance rates to medical and dental schools, and tremendous success among graduates competing for medical residencies following medical school.

## Pre-Dental Scholars

Partnering with the School of Dentistry at Marquette University, the Biomedical Sciences department offers an accelerated option as part of the Pre-Dental Scholar program, allowing students to complete their undergraduate degree within the first year of the dental school program. Students who are admitted directly to the Pre-Dental Scholar program or those admitted following freshmen year must meet the academic standards set by the School of Dentistry to continue within the program. Students who do not meet the academic requirements work with their advisers to complete the standard Biomedical Sciences major.

## PRE-law SCHOLARS

Partnering with the Law School at Marquette University, the Biomedical Sciences department offers an accelerated option as part of the Pre-Law Scholar program, allowing students to complete their undergraduate degree within the first year of the law school program. Students who are admitted directly to the Pre-Law Scholar program must meet the academic standards set by the Law School to continue within the program. Students who do not meet the academic requirements work with their advisers to complete the standard Biomedical Sciences major.

## Early Assurance PharmD Program

The Biomedical Sciences department participates in the Early Assurance PharmD Program through the university's partnership with the Medical College of Wisconsin (MCW) School of Pharmacy. The 3+3 Early Assurance PharmD program allows students in the Biomedical Sciences major to earn dual degrees, a bachelor's degree from Marquette University and a Doctor of Pharmacy degree from the Medical College of Wisconsin, in a total of six years. Students accepted to this program who meet all eligibility requirements throughout the program, can matriculate to MCW's Schools of Pharmacy in their senior year. A bachelor of science degree from Marquette University is awarded after successful completion of the first year at MCW. Applications to the program are due at the start of the spring term in freshman or sophomore year. Interested students should consult with their academic adviser in biomedical sciences. More detailed information can be found in the university Special Academic Programs (<http://bulletin.marquette.edu/undergrad/academicprograms/pharmdprogram>) section of this bulletin.

## Early Admission Option to Physician Assistant Studies

Partnering with the Department of Physician Assistant Studies at Marquette University, the Biomedical Sciences department created a 3+2\* early admission opportunity to the Physician Assistant (PA) Studies program. Students who complete the first three years of the pre-physician assistant curriculum are eligible to apply to the Marquette University Physician Assistant Studies program as early as the summer after their sophomore year. Admitted students complete their undergraduate degree in Biomedical Sciences within the first year of the PA program. A Master of Physician Assistant Studies degree is awarded upon graduation from the PA program. Students who do not enter the PA program their Senior year continue within the Biomedical Sciences major. The department has course outlines for those who enter the PA program following their Senior year and for those who complete the standard bachelor's degree. Students work with their advisers to identify the most appropriate program.

\* The change of the current 2+3 program (two years of undergraduate study and three years of PA) to a 3+2 program (three years of undergraduate study and two years of PA) is pending final approval of the Accreditation and Review Commission on Physician Assistant Education (ARC-PA)

## MBA Accelerated Degree Program (ADP)

Marquette undergraduate students majoring in Biomedical Sciences can apply for admission to the Master of Business Administration (MBA) program in the second term of their junior year. Students accepted into this program are eligible to enroll in up to 12 credits of MBA course work that carry graduate credit during their senior year. Credits obtained for these courses can be used to fulfill both undergraduate and graduate degree requirements. Due to the number of prerequisite courses required for admission to the MBA program, the MBA accelerated degree option requires careful planning as early as freshman year. Interested students should contact their adviser early in their undergraduate career. Once students inform the Graduate School of Management of their completion of undergraduate degree requirements, their admission as a regular degree status (RDS) student in the Graduate School of Management is activated.

## Degree requirements

### Academic Performance

All students must comply with the College of Health Sciences graduation requirements. Candidates for a degree must earn at least the minimum number of credits listed in their curriculum and a minimum GPA of 2.000. Students must earn a C or better in all major courses. Major courses completed with a C- or below do not count toward the 33 credits required for the BISC major (or 18 credits for the minor), but do count toward the minimum 128 total credits required for the B.S. degree. A waiver may be submitted if a BISC major course taken in the final semester before expected graduation is completed with a passing grade below a C (C-, D+ or D grade) provided students complete at least 33 credits in the major with a C or above. A waiver request will be granted for no more than one course.

**Candidates for the baccalaureate degree with a major in Biomedical Sciences must complete a minimum of 128 credit hours including the following requirements:**

Area	Credit Hours
Marquette Core Curriculum (MCC)	30
Required Foundational Courses	24-27
Major	33
General Electives	to achieve 128 total credits

### Marquette Core Curriculum (MCC) - 30 Credits

Refer to the Marquette Core Curriculum (MCC) in the University section of this bulletin for courses that will meet requirements. The university allows a maximum of two courses in the Discovery Tier to apply towards a primary major.

### Required Foundational Courses

All students are required to complete:

BIOL 1001	General Biology 1	3
BIOL 1002	General Biology 2	3
CHEM 1001	General Chemistry 1	4
CHEM 1002	General Chemistry 2	4
CHEM 2111	Organic Chemistry 1	1-4
or BISC 2050	Organic Chemistry for the Health Sciences	

One of the following laboratory science courses: 3

BIOL 2001	Principles of Biological Investigation
CLLS 2200	Concepts in Clinical Laboratory Medicine

PHAS 7270	Diagnostics Technology (For students admitted to the PA program)	
One of the following statistics courses:		3
MATH 1700	Modern Elementary Statistics	
MATH 4740	Biostatistical Methods and Models	
MATH 4720	Statistical Methods	
PSYC 2001	Psychological Measurements and Statistics ((4 credits))	
SOCI 2060	Social Statistics	
One of the following Health and Society Courses:		2
BISC 3157	Global Health (Can be used as a Health and Society Cognate or BISC elective, but not both)	
BISC 4153	Epidemiology (Can be used as a Health and Society Cognate or BISC elective, but not both)	
BISC 4170	Biology, Moral Behavior and Policy (Can be used as a Health and Society Cognate or BISC elective, but not both)	
BISC 4275	Modern Plagues: Stress, Trauma and Addiction (Can be used as a Health and Society Cognate or BISC elective, but not both)	
BISC 4381	Politics of U.S. Health Care (or POSC 4381 with special permission)	
BISC 4461	Comparative Health Politics and Policy (or POSC 4461 with special permission)	
CLLS 2060	Public Health (Can be used as a Health and Society Cognate or BISC elective, but not both)	
CMST 4500	Health Communication	
COMM 4330	Health, Science and Environmental Communication	
HEAL 1025	Culture and Health	
HEAL 1200	Women's Health	
HEAL 1400	Veteran Health and Culture	
HEAL 2100	Primary Health Care Concepts	
PHAS 7095	Public Health (for students admitted to the PA program)	
PSYC 2101	Introduction to Life-Span Developmental Psychology for Nursing Students	
PSYC 3101	Developmental Psychology: Conception Through Adolescence	
PSYC 3120	Developmental Psychology: Adulthood and Aging	
PSYC 3220	Human Sexuality	
PSYC 3420	Health Psychology	
SOCI 3300	Sociology of the Life Course	
SOCI 3500	Culture, Health and Illness	
SOCI 3520	Health Care Systems	
SOCI 3550	Race, Gender and Medicine	
SOCI 3570	Men, Masculinities and Health	
SOCI 4300	Sociology of Aging	
SOWJ 1001	Introduction to Social Welfare and Justice	
SOWJ 2200	Human Behavior in the Social Environment	
SOWJ 4700	Global Aid and Humanitarianism	
SPAN 4715	Advanced Spanish for Health Care	
Note: Biomedical Sciences often offers special topics courses (BISC 4930) which may be approved for the Health and Society cognate. Students should confirm with their adviser whether a course fulfills the requirement. To request approval, a student must submit a Health and Society Approval Form, available in the department office.		
One of the following medical ethics courses (minimum 1 credit):		1
PHAS 7245	Professional Issues (1 credit)	
PHIL 4336	Applied Ethics for the Health Sciences (1 credit)	
PHIL 4335	Biomedical Ethics (3 credits)	
THEO 4450	Medical Ethics (3 credits)	

Total Credit Hours

24-27

**Students who are interested in pursuing a professional or graduate education (i.e. pre-med, pre-dental) should take the following courses:**

CHEM 2111	Organic Chemistry 1
CHEM 2112	Organic Chemistry 2
PHYS 1001	General Physics 1

PHYS 1002	General Physics 2
BIOL 2001	Principles of Biological Investigation
MATH 1410	Calculus for the Biological Sciences
SOCI 1001	Principles of Sociology
PSYC 1001	General Psychology

Typical four-year curriculum plans for Biomedical Sciences (p. 6), Pre-Physician Assistant Studies (p. 9), Direct Admit Physical Therapy (p. 7), and Pre-Dental Scholars (p. 8) follow the listing of Biomedical Sciences Major requirements.

## Biomedical Sciences Major

The major in biomedical sciences consists of a minimum of 33 credit hours and must be completed with a C grade or better. A maximum of 9 transfer credits can be applied towards the major. The following courses are required:

### Required Courses

BISC 3135	Clinical Human Anatomy	4
BISC 3213	Biochemistry	3-4
or BISC 2070	Biochemistry for the Health Professions	
BISC 4145	Human Physiology	4

Content Areas: Choose the number of courses/credits indicated from each of the content areas below.

### Anatomy and Systems (One course, a maximum of 3 credits apply toward the major) 3

BISC 3112	Head and Neck Anatomy
BISC 3850	Systems Neuroscience
BISC 4140	Functional Neuroanatomy
BISC 4173	Principles of Human Embryology
BISC 4325	Endocrinology
BISC 4514	Human Microanatomy (4 credits; only 3 credits apply toward the 33 total credits needed for the major, all credits apply towards the 128 overall credits needed for the degree)
BISC 7130	Human Gross Anatomy (5 credits; must be enrolled in the DPT or MPA programs; only 3 credits apply towards the 33 total credits needed for the major, all credits apply towards the 128 overall credits needed for the degree)
BISC 7515	Biomedical Systems 1 (Pre-Dental Scholars only)

### Cell and Molecular (Two courses, a minimum of 6 credits) 6

BISC 3115	Human Microbiology (Substitute BISC 7410 for Pre-Dental Scholar or MPA program only)
or BISC 7410	Microbiology
BISC 4160	Molecular Pathology (can be used for either Cell and Molecular Content Area or Diseases and Pathology Content Area, but not both)
BISC 4340	Human and Applied Medical Genetics
BIOL 3201	Genetics
BIOL 3301	Cell Biology
BIOL 4501	Cellular Neurobiology
BIOL 4806	Immunobiology

### Diseases and Pathology (Two courses, a minimum of 6 credits) 6

BISC 3150	General Pathology
BISC 4120	Pharmacology (Substitute BISC 7220 for MPA program only)
or BISC 7220	Medical Pharmacology
BISC 4150	Outbreaks, Epidemics and Pandemics
BISC 4155	Diseases of the Brain
BISC 4160	Molecular Pathology (can be used for either Cell and Molecular Content Area or Diseases and Pathology Content Area, but not both)
BISC 4275	Modern Plagues: Stress, Trauma and Addiction
PHTH 7515	Clinical Pathology and Pathophysiology (only for students admitted to DPT program)

**Biomedical Sciences Electives:** 5-6 credit hours selected from the following list, or any additional courses within a content area listed above, to total the 33 credit hours required for the major completed with a minimum grade of C.

BISC 1001	Contemporary Issues in Biomedical Sciences (required course for all first semester freshman)	1
BISC 1030	Introduction to Dentistry (can only be applied as an elective for Pre-Dental Scholars)	1
BISC 3110	Nutritional Aspects of Health	3
BISC 3112	Head and Neck Anatomy	3
BISC 3115	Human Microbiology	3
BISC 3136	Gross Anatomy for the Biomedical Sciences	2
BISC 3150	General Pathology	3
BISC 3157	Global Health	3
BISC 3850	Systems Neuroscience	3
BISC 3859	Evolution	3
BISC 3987	Internship in Biomedical Sciences-Work Period	0
BISC 4120	Pharmacology	3
BISC 4140	Functional Neuroanatomy	3
BISC 4142	Science and Society <sup>1</sup>	1
BISC 4146	Physiology In Depth: Contemporary Issues <sup>1</sup>	1
BISC 4147	Human Physiology Laboratory	1
BISC 4150	Outbreaks, Epidemics and Pandemics	3
BISC 4151	Advanced Pathology <sup>1</sup>	1
BISC 4153	Epidemiology (can fulfill Health and Society Cognate or BISC elective, but not both)	3
BISC 4155	Diseases of the Brain	3
BISC 4160	Molecular Pathology	3
BISC 4165	Microbiology Laboratory	1
BISC 4170	Biology, Moral Behavior and Policy (can fulfill Health and Society Cognate or BISC elective, not both)	3
BISC 4173	Principles of Human Embryology	3
BISC 4210	Biology of Aging	3
BISC 4214	Advanced Biochemistry <sup>1</sup>	1
BISC 4275	Modern Plagues: Stress, Trauma and Addiction (can fulfill Health and Society Cognate or BISC elective, but not both)	3
BISC 4325	Endocrinology	3
BISC 4340	Human and Applied Medical Genetics	3
BISC 4341	Advanced Cellular Genetics and Cancer <sup>1</sup>	1
BISC 4460	Practical Cases in Medicine	3
BISC 4514	Human Microanatomy	4
BISC 4851	Advanced Systems Neuroscience <sup>1</sup>	1
BISC 4931	Topics in Biomedical Sciences <sup>1</sup>	1-3
BISC 4953	Readings in Human Anatomy <sup>1</sup>	1
BISC 4986	Internship in Biomedical Sciences (maximum 6 credits, 3 credits toward BISC major)	1-3
BISC 4987	Internship in Biomedical Sciences-Grading Period (maximum 6 credits, 3 credits toward BISC major)	1-3
BISC 4988	Research Internship in Biomedical Sciences (maximum 6 credits, 3 credits toward BISC major)	1-3
BISC 4989	Research Internship in Biomedical Sciences-Grading Period (maximum 6 credits, 3 credits toward BISC major)	1-3
BISC 4991H	Honors Community Engagement in Biomedical Sciences (Only for students in the Disciplinary Honors Program; maximum 6 credits, 3 credits toward BISC major)	1-3
BISC 4995	Independent Study in Biomedical Sciences (Maximum 6 credits, 3 credits toward BISC major) <sup>1</sup>	1-3
BISC 4997H	Capstone for Disciplinary Honors Program in Biomedical Sciences (Only for students in the Disciplinary Honors Program)	1
BISC 7180	Clinical Neuroanatomy (for students in the PA program)	3
BISC 7514	Human Microanatomy (only for Pre-Dental Scholars)	4
BISC 7516	Biomedical Systems 2 (only for Pre-Dental Scholars)	4
BIOL 4102	Experimental Molecular Biology	3
BIOL 4202	Experimental Genetics	3
BIOL 4302	Experimental Cell Biology	3
BIOL 4501	Cellular Neurobiology	3

BIOL 4502	Experimental Neurobiology	3
BIOL 4702	Experimental Physiology	3
BIOL 4806	Immunobiology	3
CLLS 2050	Forensic Science	3
CLLS 2060	Public Health (can fulfill Health and Society Cognate or BISC elective, not both)	3
PHTH 7120	Pharmacology in Physical Therapy (only for students admitted to DPT program)	2
A maximum of nine transfer credit hours can be applied toward the requirements for a major		

<sup>1</sup> Corresponding Disciplinary Honors course can also fulfill this requirement for students admitted into that program.

## Curricula Information

### Typical Program for Biomedical Sciences Majors

#### Freshman

First Term	Hours	Second Term	Hours
BISC 1001	1	BIOL 1002 <sup>1</sup>	3
BIOL 1001 <sup>1</sup>	3	CHEM 1002 <sup>1</sup>	4
CHEM 1001 <sup>1</sup>	4	PSYC 1001 <sup>1</sup>	3
ENGL 1001 or ESSV1 (MCC)	3	PHIL 1001 or THEO 1001 (MCC)	3
PHIL 1001 or THEO 1001 (MCC)	3	ENGL 1001 or ESSV1 (MCC)	3
General elective	3		
	17		16

#### Sophomore

First Term	Hours	Second Term	Hours
BISC 3135	4	CHEM 2112 or elective <sup>1</sup>	4
CHEM 2111 or BISC 2050 (and 3 cr. electives)	4	BISC 2070 or 3213	3-4
BIOL 2001 or other approved lab cognate	3	Statistics cognate	3
MATH 1410 or elective <sup>1</sup>	3	CORE 1929 (MCC)	3
General elective	3	DSCV (MCC) <sup>2,3</sup>	3
	17		16-17

#### Junior

First Term	Hours	Second Term	Hours
PHYS 1001 or elective <sup>1</sup>	4	PHYS 1002 or elective <sup>1</sup>	4
BISC 4145	4	Diseases and Pathology course	3
Anatomy and Systems course <sup>4</sup>	3	Cell and Molecular course	3
Health and Society cognate	3	DSCV (MCC) <sup>2,3</sup>	3
DSCV (MCC) <sup>2,3</sup>	3		
	17		13

#### Senior

First Term	Hours	Second Term	Hours
Cell and Molecular course	3	Diseases and Pathology course	3
BISC elective	3	BISC elective	3-2
DSCV (MCC) <sup>2,3</sup>	3	Medical Ethics	1

General elective	7 CORE 4929 (MCC)	3
	General electives	6
	16	16-15

Total credit hours: 128

- <sup>1</sup> Courses required for many post-graduate/professional programs, consult with specific program(s) of interest to confirm prerequisites.
- <sup>2</sup> The four courses in the Discovery Tier (DSCV) of the MCC must be completed in the same theme and include the following content areas: Humanities (HUM), Social Science (SSC), Natural Science and Mathematics (NSM) and one elective (ELE), which is any additional course from any of the three content areas. A maximum of two courses in the Discovery Tier can apply towards a primary major.
- <sup>3</sup> Students must also complete the Writing Intensive (WRIT) and Engaging Social System and Values 2 (ESSV2) requirements of the MCC. These requirements can be fulfilled through designated courses in the Discovery Tier or other degree requirements.
- <sup>4</sup> Only 3 credits count toward the 33 total credits for the major. The total course credit number counts toward the 128 needed for the degree.

## Typical Program for Biomedical Sciences Majors - Direct Admit Physical Therapy Students

Partnering with the Physical Therapy program at Marquette University, the Biomedical Sciences Department has established an accelerated option for the Direct Admit Physical Therapy program, allowing students to complete their undergraduate degree after the first year of the professional phase of the program. Students who were admitted directly to the Physical Therapy Program or those admitted following their Junior year (space permitting) must meet the academic standards set by the Physical Therapy Department to continue in the program. Students who do not meet the academic requirements work with their advisers to complete the standard Biomedical Sciences major.

### Freshman

First Term	Hours	Second Term	Hours
BISC 1001	1	BIOL 1002	3
BIOL 1001	3	CHEM 1002	4
CHEM 1001	4	PSYC 1001	3
ENGL 1001 or ESSV1 (MCC)	3	PHIL 1001 or THEO 1001 (MCC)	3
PHIL 1001 or THEO 1001 (MCC)	3	ENGL 1001 or ESSV1 (MCC)	3
General elective	3		
	17		16

### Sophomore

First Term	Hours	Second Term	Hours
BISC 3135	4	BISC 2070 (or BISC 3213 for 4 cr.)	3
BISC 2050	1	BIOL 2001	3
PSYC 3101, 3120, or 3401 (PSYC for DPT)	3	Statistics cognate	3
CORE 1929 (MCC)	3	PHTH 1001 <sup>3</sup>	1
DSCV (MCC) <sup>1,2</sup>	3	DSCV (MCC) <sup>1,2</sup>	3
General elective	2	DSCV (MCC) <sup>1,2</sup>	3
	16		16

### Junior

First Term	Hours	Second Term	Hours
PHYS 1001	4	PHYS 1002	4
BISC 4145	4	Diseases and Pathology course	3
Cell and Molecular course	3	Cell and Molecular course	3
Health and Society cognate	3	BISC elective	3
DSCV (MCC) <sup>1,2</sup>	3	Medical Ethics	1

		CORE 4929 (MCC)	3
	17		17
<b>Senior</b>			
<b>First Term</b>	<b>Hours</b>	<b>Second Term</b>	<b>Hours</b>
BISC 7130 (Anatomy and Systems) <sup>4</sup>	5	PHTH 7120 (BISC Elective)	2
Remaining DPT Curriculum	9	PHTH 7515 (Disease and Pathology)	4
		Remaining DPT Curriculum	9
	14		15

Total credit hours: 128

- <sup>1</sup> The four courses in the Discovery Tier (DSCV) of the MCC must be completed in the same theme and include the following content areas: Humanities (HUM), Social Science (SSC), Natural Science and Mathematics (NSM) and one elective (ELE), which is any additional course from any of the three content areas. A maximum of two courses in the Discovery Tier can apply towards a primary major.
- <sup>2</sup> Students must also complete the Writing Intensive (WRIT) and Engaging Social System and Values 2 (ESSV2) requirements of the MCC. These requirements can be fulfilled through designated courses in the Discovery Tier or other degree requirements.
- <sup>3</sup> Students who are not direct admit PT students are not required to complete PHTH 1001, but it is strongly recommended.
- <sup>4</sup> Only 3 credits count toward the 33 total credits for the major. The total course credit number counts toward the 128 needed for the degree. All courses completed prior to awarding of B.S. degree count toward the undergraduate GPA and the determination of academic honors. Completion of the B.S. degree is required by end of the DPT5 spring term and before a student proceeds to the final DPT6 year (summer, fall, spring).

## Typical Program for Biomedical Sciences Majors - Pre-Dental Scholars

Partnering with the School of Dentistry at Marquette University, the Biomedical Sciences Department has established an accelerated track option through the Pre-Dental Scholar Program, allowing students to complete their undergraduate degree within the first year of the dental school program. Students who were admitted directly to the Pre-Dental Scholar Program or those admitted following Freshmen year must meet the academic standards set by the School of Dentistry to continue in the program. Students who do not meet the academic requirements work with their advisers to complete the standard Biomedical Sciences major.

<b>Freshman</b>			
<b>First Term</b>	<b>Hours</b>	<b>Second Term</b>	<b>Hours</b>
BISC 1001	1	BIOL 1002	3
BIOL 1001	3	CHEM 1002	4
CHEM 1001	4	BISC 1030	1
ENGL 1001 or ESSV1 (MCC)	3	PHIL 1001 or THEO 1001 (MCC)	3
PHIL 1001 or THEO 1001 (MCC)	3	ENGL 1001 or ESSV1 (MCC)	3
General elective	3	General elective	3
	17		17
<b>Sophomore</b>			
<b>First Term</b>	<b>Hours</b>	<b>Second Term</b>	<b>Hours</b>
BISC 3135	4	CHEM 2112	4
CHEM 2111	4	BISC 2070 (or BISC 3213 for 4 cr.)	3
Statistics cognate	3	BIOL 2001	3
CORE 1929 (MCC)	3	DSCV (MCC) <sup>1,2</sup>	3
General elective	3	DSCV (MCC) <sup>1,2</sup>	3
	17		16

**Junior**

First Term	Hours	Second Term	Hours
PHYS 1001	4	PHYS 1002	4
BISC 4145	4	Diseases and Pathology course	3
Disease and Pathology course	3	Cell and Molecular course	3
Health and Society cognate	3	Medical Ethics	1
DSCV (MCC) <sup>1,2</sup>	3	CORE 4929 (MCC)	3
		DSCV (MCC) <sup>1,2</sup>	3
		<hr/>	
		17	17

**Senior**

First Term	Hours	Second Term	Hours
BISC 7410 (Cell and Molecular)	4	BISC 7516	4
BISC 7514 (BISC elective)	4	D1 Clinical Curriculum <sup>3</sup>	12
BISC 7515 (Anatomy and Systems)	3		
Remaining D1 Clinical Curriculum <sup>3</sup>			
		<hr/>	
		11	16

Total credit hours: 128

- <sup>1</sup> The four courses in the Discovery Tier (DSCV) of the MCC must be completed in the same theme and include the following content areas: Humanities (HUM), Social Science (SSC), Natural Science and Mathematics (NSM) and one elective (ELE), which is any additional course from any of the three content areas. A maximum of two courses in the Discovery Tier can apply towards a primary major.
- <sup>2</sup> Students must also complete the Writing Intensive (WRIT) and Engaging Social System and Values 2 (ESSV2) requirements of the MCC. These requirements can be fulfilled through designated courses in the Discovery Tier or other degree requirements.
- <sup>3</sup> Individual courses listed above apply towards the BISC major requirements. The remaining clinical curriculum credits in D1 year apply toward the 128 total credits required for the B.S. degree and are included in the GPA calculations for the B.S. degree and academic honors.

## Typical Program for Biomedical Sciences B.S. / Physician Assistant Studies Early Admission Option<sup>3</sup>

Partnering with the Department Physician Assistant Studies at Marquette University, the Biomedical Sciences Department has created an opportunity for early admission into the two-year Physician Assistant Studies (PA) program. Students who complete the first three years of the pre-physician assistant curriculum are eligible to apply to the Marquette University PA program in their junior year. Admitted students begin their PA1 year in summer after junior year and complete their undergraduate degree in Biomedical Sciences after the first year of the physician assistant program. A Master of Physician Assistant Studies is awarded upon graduation from the PA program. Students who do not enter the PA program before their senior year complete the standard Biomedical Sciences major.

**Freshman**

First Term	Hours	Second Term	Hours
BISC 1001	1	BIOL 1002	3
BIOL 1001	3	CHEM 1002	4
CHEM 1001	4	PHIL 1001 or THEO 1001 (MCC)	3
ENGL 1001 or ESSV1 (MCC)	3	ENGL 1001 or ESSV1 (MCC)	3
PHIL 1001 or THEO 1001 (MCC)	3	PSYC 1001	3
General elective	3		
		<hr/>	
		17	16

**Sophomore**

<b>First Term</b>	<b>Hours</b>	<b>Second Term</b>	<b>Hours</b>
BISC 3135	4	BISC 3213	4
CHEM 2111	4	CHEM 2112	4
CORE 1929 (MCC)	3	Statistics Cognate	3
DSCV (MCC) <sup>1,2</sup>	3	DSCV (MCC) <sup>1,2</sup>	3
General elective	3	BISC 2020	1
	17		15

**Junior**

<b>First Term</b>	<b>Hours</b>	<b>Second Term</b>	<b>Hours</b>	<b>Summer Term</b>	<b>Hours</b>
BISC 4145	4	Diseases and Pathology course	3	BISC 7130 (Anatomy & Systems)	5
BISC 3115 (Cell & Molecular)	3	Cell and Molecular course	3	BISC 7180 (BISC Elective)	3
DSCV (MCC) <sup>1,2</sup>	3	BISC Elective	3	BISC 7220 (Disease & Pathology)	4
DSCV (MCC) <sup>1,2</sup>	3	Medical Ethics	1	PHAS 7270 (Lab Cognate)	4
Elective	3	CORE 4929 (MCC)	3	Remaining PA Curriculum	5
		Elective	3		
	16		16		21

**Senior**

<b>First Term</b>	<b>Hours</b>	<b>Second Term</b>	<b>Hours</b>	<b>Summer Term</b>	<b>Hours</b>
PA Curriculum	17	PA Curriculum	18	PHAS 7118 (Health & Society Cognate)	2
				Remaining PA Curriculum	14
	17		18		16

Total credit hours: 169

- <sup>1</sup> The four courses in the Discovery Tier (DSCV) of the MCC must be completed in the same theme and include the following content areas: Humanities (HUM), Social Science (SSC), Natural Science and Mathematics (NSM) and one elective (ELE), which is any additional course from any of the three content areas. A maximum of two courses in the Discovery Tier can apply towards a primary major.
- <sup>2</sup> Students must also complete the Writing Intensive (WRIT) and Engaging Social System and Values 2 (ESSV2) requirements of the MCC. These requirements can be fulfilled through designated courses in the Discovery Tier or other degree requirements.
- <sup>3</sup> PA curriculum subject to change pending accreditation approval.

## Typical Program for Biomedical Sciences B.S. / Medical College of Wisconsin (MCW) PharmD Early Assurance Program<sup>3</sup>

Partnering with the Medical College of Wisconsin Pharmacy School, the Biomedical Sciences Department has created an opportunity for early admission into the PharmD program. MU students in the biomedical sciences major are eligible to apply to the competitive Medical College of Wisconsin Pharmacy School's Early Assurance program early spring of the freshmen or sophomore year. Admitted students who complete all program requirements, earn an undergraduate degree in Biomedical Sciences from Marquette University after the first year of the PharmD program. A Doctor of Pharmacy is awarded by MCW upon successful completion of the three-year PharmD program. Students who do not enter the PharmD program before the senior year continue within the Biomedical Sciences major to complete the bachelor's degree.

**Freshman**

<b>First Term</b>	<b>Hours</b>	<b>Second Term</b>	<b>Hours</b>
BISC 1001	1	BIOL 1002	3
CHEM 1001	4	CHEM 1002	4
BIOL 1001	3	MATH 1400, 1410, or 1450	3

PHIL 1001 or THEO 1001 (MCC)	3	PHIL 1001 or THEO 1001 (MCC)	3
ENGL 1001 or ESSV1 (MCC)	3	ENGL 1001 or ESSV1 (MCC)	3
General elective	3		
	17		16

**Sophomore**

First Term	Hours	Second Term	Hours
BISC 3135	4	CHEM 2112	4
CHEM 2111	4	BISC 2070 (or BISC 3213 for 4 cr.)	3
PSYC 1001	3	BIOL 2001	3
CORE 1929 (MCC)	3	DSCV (MCC) <sup>1,2</sup>	3
DSCV (MCC) <sup>1,2</sup>	3	ECON 1001, 1040, 1103, or 1104	3
	17		16

**Junior**

First Term	Hours	Second Term	Hours
PHYS 1001	4	Diseases and Pathology course	3
BISC 4145	4	BISC Elective	3
Statistics Cognate	3	Medical Ethics	1
DSCV (MCC) <sup>1,2</sup>	3	CORE 4929 (MCC)	3
DSCV (MCC) <sup>1,2</sup>	3	COMM 1100, CMST 2000, or CMST 3120	3
	17		13

Total credit hours: 96

**Note:** Senior Year completed at MCW.

For students accepted to the Early Assurance PharmD Program with MCW, the reverse transfer agreement allows for courses satisfactorily completed in the first year at MCW to transfer to MU (credits only, not grades) to satisfy the degree requirements listed below. Students who meet all early assurance program requirements<sup>3</sup> are eligible to walk in MU's graduation ceremony in May of their first year at MCW.

Department	Credit Hours
BISC Cellular and Molecular Content	8
BISC Anatomy and Systems Content	3
BISC Disease and Pathology Content	5
BISC Health and Society	3
General Electives	13

<sup>1</sup> The four courses in the Discovery Tier (DSCV) of the MCC must be completed in the same theme and include the following content areas: Humanities (HUM), Social Science (SSC), Natural Science and Mathematics (NSM) and one elective (ELE), which is any additional course from any of the three content areas. A maximum of two courses in the Discovery Tier can apply towards a primary major.

<sup>2</sup> Students must also complete the Writing Intensive (WRIT) and Engaging Social System and Values 2 (ESSV2) requirements of the MCC. These requirements can be fulfilled through designated courses in the Discovery Tier or other degree requirements.

<sup>3</sup> At least 60 credits must be completed at MU (excludes test, CLEP and transfer credit). More than 50% of the 33 credits in the BISC major must be completed at MU (17 credits or more). To qualify for academic honors at MU, at least 32 upper division credits must be completed at MU (3000 level or higher).

## Biomedical Sciences B.S. / M.B.A. Accelerated Degree Programs

The Department of Biomedical Sciences together with the Graduate School of Management offers an accelerated degree program which allow students to earn their B.S. in Biomedical Sciences, and a master of business administration (M.B.A.), all within a five-year time period.

Marquette undergraduate students majoring in Biomedical Sciences can apply for admission to the Master of Business Administration (MBA) program in the second term of their junior year. Prerequisites for the MBA program include the requirements for the minor in Business Administration, along with MATH 1400 or 1450 (AP credits accepted). Students accepted into the program are eligible to enroll in up to 12 credits of MBA course work during the senior year. Credits obtained for these MBA courses can be used to fulfill both undergraduate and graduate degree requirements. Due to the number of prerequisite courses required to apply to the MBA program, this accelerated degree option requires careful planning as early as freshman year.

Interested students should contact their undergraduate adviser and review the MBA information on the Graduate School of Management website. Once students inform the Graduate School of Management of their completion of undergraduate degree requirements, their admission as a regular degree status student in the Graduate School of Management is activated.

## Biomedical Sciences Minor

Requires 18 credit hours:

BISC 1060	Chemistry for the Health Professions	3
BISC 2070	Biochemistry for the Health Professions	3
BISC 3110	Nutritional Aspects of Health	3
BISC 3112	Head and Neck Anatomy	3
BISC 3115	Human Microbiology	3
BISC 3135	Clinical Human Anatomy	4
BISC 3150	General Pathology	3
BISC 3157	Global Health	3
BISC 3213	Biochemistry	4
BISC 3850	Systems Neuroscience	3
BISC 3859	Evolution	3
BISC 4120	Pharmacology	3
BISC 4140	Functional Neuroanatomy	3
BISC 4145	Human Physiology	4
BISC 4147	Human Physiology Laboratory	1
BISC 4150	Outbreaks, Epidemics and Pandemics	3
BISC 4153	Epidemiology	3
BISC 4155	Diseases of the Brain	3
BISC 4160	Molecular Pathology	3
BISC 4165	Microbiology Laboratory	1
BISC 4170	Biology, Moral Behavior and Policy	3
BISC 4173	Principles of Human Embryology	3
BISC 4210	Biology of Aging	3
BISC 4275	Modern Plagues: Stress, Trauma and Addiction	3
BISC 4325	Endocrinology	3
BISC 4340	Human and Applied Medical Genetics	3
BISC 4514	Human Microanatomy	4
BISC 4931	Topics in Biomedical Sciences	1-3
BISC 4995	Independent Study in Biomedical Sciences (Maximum of 3 credits applied toward the minor)	1-6
BISC 7130	Human Gross Anatomy (PA and PT students only)	5
CLLS 2200	Concepts in Clinical Laboratory Medicine	3

A maximum of nine transfer credit hours can be applied toward the requirements for a minor.

For students in **non-science majors** interested in pursuing a minor in biomedical sciences, BISC 1015 Principles of Human Anatomy and Physiology (offered spring term), will fulfill the anatomy and physiology prerequisites for many courses in the minor. In addition, BISC 1060 Chemistry for the Health Professions (offered fall term) and BISC 2070 Biochemistry for the Health Professions (offered spring term) should be the first BISC minor courses completed. These two BISC minor courses fulfill the chemistry and biochemistry prerequisites for most other BISC minor courses.

**Program Director:** Doug Lobner, Ph.D.

**Honors Committee:** Doug Lobner, Ph.D., Bob Peoples, Ph.D., Maria Crowe, Ph.D., Kevin Siebenlist, Ph.D.

The Disciplinary Honors Program in Biomedical Sciences is designed for students to demonstrate exceptional work in the areas of research and community engagement, as well maintain high academic standards. Students involved in this program must go beyond normal expectations in these areas by generating an honors proposal that integrates coursework, research, community engagement, writing, and oral presentations into a coherent

plan of work. There are two specific focuses within the program, one in which the emphasis is on scientific research and the other on community engagement, although all students must include some experience in each area.

Graduation with Disciplinary Honors in Biomedical Sciences requires completion of the portfolio and participation in a second-semester senior year capstone course. As part of this course, students are required to prepare a presentation describing how they completed their Honors Plan.

## Curricular Requirements

Honors students within each focus are required to complete five courses which may be applied simultaneously to the Biomedical Sciences major as elective credit. Students should consult the Biomedical Sciences major bulletin to confirm which Honor's courses may be used toward Biomedical Sciences elective credit.

For their laboratory research experience, students within the research focus must complete six credits of BISC 4995H Honors Independent Study in Biomedical Sciences (students enroll twice, for three credits each class session) or complete three credits of BISC 4995H Honors Independent Study in Biomedical Sciences and participate in the Biomedical Sciences Summer Research Program. Participation in the summer research program is indicated by registration for a 0 credit summer course (BISC 9002H).

### Research Focus Requirements – 2 courses (3 or 6 credits)

Questions about the research focus can be directed to Dr. Lobner, [Doug.Lobner@marquette.edu](mailto:Doug.Lobner@marquette.edu)

- Six credits of honors laboratory research (BISC 4995H Honors Independent Study in Biomedical Sciences) (enrolling twice, for three credits each class session), or three credits plus participation in the summer research program (BISC 9002H)
- Thematic research plan-related curriculum
- Additional extra-curricular activities should be considered (seminar series, etc.)
- Inclusion of community engagement component (For example: assist with anatomy lab tours for high school students)
- A written component of the plan is required during one of the independent study courses or the capstone course.

### Community Engagement Focus Requirements – 2 courses (6 credits)

Questions about the community engagement focus can be directed to Autumn Swanson, [Autumn.Swanson@marquette.edu](mailto:Autumn.Swanson@marquette.edu)

- Six credits of honors community engagement course (BISC 4991H Honors Community Engagement in Biomedical Sciences) (enrolling twice, for three credits each class session)
- Thematic community engagement plan-related curriculum
- Additional extra-curricular activities should be considered (seminar series, etc.)
- Inclusion of relevant research component (For example: attend a research-based seminar series)
- A written component of the plan is required during one of the independent study courses or the capstone course.

### Curricular Requirements for both the Research and Community Engagement Focuses – 3 courses (3 credits).

In addition to the individual focus requirements, all students within the program must take two one-credit Honors courses as well as the Honors Program capstone course.

Choose two of the following courses:

BISC 4151H	Honors Advanced Pathology	1
BISC 4146H	Honors Physiology In Depth: Contemporary Issues	1
BISC 4214H	Honors Advanced Biochemistry	1
BISC 4341H	Honors Advanced Cellular Genetics and Cancer	1
BISC 4851H	Honors Advanced Systems Neuroscience	1
BISC 4953H	Readings in Human Anatomy	1
Required Capstone:		
Disciplinary Honors Capstone (BISC 4997H)		1

## Academic Standards

Students must have a 3.200 cumulative grade point average for entry into the Disciplinary Honors Program in Biomedical Sciences. Students must achieve a 3.200 cumulative grade point average in order to graduate with an Honors Program degree. If students drop below a 3.200 in any given semester during the junior year or any subsequent year, they receive a letter of warning from the director. If students drop below a 3.200 cumulative GPA, they are placed on Honors Program academic probation; if they do not achieve a 3.200 cumulative by the end of the following semester, they are removed from the program. Students must earn a grade of C or better in a course for it to count toward the Honors Degree.

## Eligibility

The program is structured to be completed over the last two years of students' academic career. Sophomores are eligible to apply to the program near the end of the spring semester as long as they meet the 3.2 minimum cumulative GPA requirement.

## Application

The application requires a comprehensive Honors Plan addressing three core honors themes: Academic Excellence, Research, and Community Engagement. Along with the Honors Plan submission, students must identify a faculty mentor who will sponsor their plan.

The Disciplinary Honors Program in Biomedical Sciences Committee approves the plans and selects a limited number of honors applicants to participate in the program.

Sample proposals, application deadline and application forms can be accessed at the Department of Biomedical Sciences Web page.

## Courses

### **BISC 1001. Contemporary Issues in Biomedical Sciences. 1 cr. hr.**

Introduction to the field of biomedical sciences with a special emphasis on current topics in health and medicine, development of critical thinking skills, and professional development. S/U grading basis. Prereq: BISC major with Freshman stdng.

### **BISC 1015. Principles of Human Anatomy and Physiology. 5 cr. hrs.**

Principles of Human Anatomy and Physiology is an introduction to the structures and functions of the human body. Laboratory included.

### **BISC 1030. Introduction to Dentistry. 1 cr. hr.**

An introduction to the diverse aspects of the dental profession, featuring guest speakers and hands-on laboratory techniques. S/U grade assessment. Prereq: Cons. of dept. ch.

### **BISC 1035. Principles of Human Anatomy. 4 cr. hrs.**

A study of the fundamental anatomical structure and organization of the organs and systems of the human body. Prereq: BIOL 1001 and EXPH major.

### **BISC 1060. Chemistry for the Health Professions. 3 cr. hrs.**

An introduction to general chemistry and organic chemistry stressing those aspects necessary for the health professions. Prereq: NURS major.

### **BISC 2015. Anatomy and Physiology for the Health Sciences 1. 3 cr. hrs.**

The first module of a human anatomy and physiology course sequence for pre-professional students in the health sciences. Provides an introduction to the structures and functions of the human body. Laboratory included. Prereq: EXPH or ATTR major.

### **BISC 2016. Anatomy and Physiology for the Health Sciences 2. 3 cr. hrs.**

The second module of a human anatomy and physiology course sequence for pre-professional students in the health sciences. Provides an introduction to the structures and functions of the human body. Laboratory included. Prereq: BISC 2015.

### **BISC 2020. Medical Terminology. 1 cr. hr.**

Studies medical terminology organized by body systems with a focus on prefixes, suffixes, word roots and their combining form. Does not apply towards BISC major electives. Prereq: BISC 2135 and BISC major.

### **BISC 2050. Organic Chemistry for the Health Sciences. 1 cr. hr.**

An introduction to organic chemistry stressing those aspects necessary for biochemistry and health care. Prereq: CHEM 1001 and CHEM 1002.

### **BISC 2070. Biochemistry for the Health Professions. 3 cr. hrs.**

Survey course of carbohydrates, lipids, proteins, enzymes, bioenergetics, metabolism of carbohydrates, lipids, proteins, and nucleotides. Emphasis placed on health and disease. Prereq: BISC 1060; or courses in general and organic chemistry; or cons. of instr.

### **BISC 3110. Nutritional Aspects of Health. 3 cr. hrs.**

Basic principles and fundamentals of human nutrition. Nutrients are discussed in terms of sources, absorption, metabolism and utilization, deficiency, requirements, and assessment of status. Life cycle nutrition and nutrition in disease states. Intended audience: future health care professionals. Prereq: A course in Biochemistry, or enrolled in the Biomedical Sciences Post-Bacc program, or cons. of instr. Not to be taken for credit by students who have had BISC 1010 or HEAL 2045.

### **BISC 3112. Head and Neck Anatomy. 3 cr. hrs.**

Survey of neuroanatomy, sensory systems and speech, muscular and vascular systems, and osteology of the head and neck. An emphasis is placed on functional anatomy and significant clinical correlates. Laboratory included. Applies toward the Anatomy and Systems Content Area. Prereq: BISC 3135 and BISC major; or cons. of instr.

### **BISC 3115. Human Microbiology. 3 cr. hrs.**

Provides foundational knowledge of infectious agents of human medical importance and how the body responds to those pathogens. Covers the physiology, genetics and pathogenesis of diseases caused by bacteria, viruses, fungi and parasites as well as their diagnosis, prevention and treatment. Microbial control, antibiotics and vaccination are also covered. Immunology and host-pathogen interactions are highlighted throughout the course. Applies toward the Cell and Molecular Content Area. Prereq: BISC major, BIOL 1002, and a biochemistry course, which may be taken concurrently; or cons. of instr.

**BISC 3135. Clinical Human Anatomy. 4 cr. hrs.**

A regional approach to human anatomy where all body systems are integrated. Correlations between structure and function are emphasized. Required course for BISC major. Laboratory included. Prereq: BISC major, BIOL 1001 and BIOL 1002 and soph. stndg; or cons. of instr.

**BISC 3136. Gross Anatomy for the Biomedical Sciences. 2 cr. hrs.**

This undergraduate human gross anatomy laboratory course takes a regional approach to the dissection of human cadaveric material and includes all body structures/systems. Space reserved for Biomedical Sciences majors in good standing. Enrollment is limited based upon specimen availability. Applies toward BISC major as elective credit only. Prereq: BISC 3135 and cons. of instr.

**BISC 3150. General Pathology. 3 cr. hrs.**

Overview of cellular degenerations, inflammation and neoplasia. Various organ systems and their primary disease states will then be presented. These systems include musculoskeletal, nervous, cardiovascular, pulmonary, reproductive, digestive, endocrine, and integument. Taught using lecture note handouts, Power Point, websites and examination objectives. Applies toward the Diseases and Pathology content area. Prereq: BISC major and courses in anatomy and physiology, which may be taken concurrently; or PPTH major; or PHAS major; or enrolled in the Biomedical Sciences Post-Baccalaureate program; or cons. of instr.

**BISC 3157. Global Health. 3 cr. hrs.**

Disease knows no borders. The health of populations in one country can be affected by public health threats or events across the globe. Policy decisions made in a country regarding public health could impact the health of people beyond its borders. Globalization shapes public health challenges and has profound influence on the capacities of countries to respond to health threats that often lie outside the control of any nation and outside health sector. Simply, globalization on health and the transfer of health threats exist. Opportunities across national borders could be utilized to solve global health challenges. Learners are introduced to the world's vast diversity of determinants of health and disease. Learners have an opportunity to critically appraise health systems in different parts of the world. Learners analyze current and emerging global health priorities, including infectious diseases, poverty, conflicts and emergencies, health inequity, principles and impact of health systems reforms, and major global initiatives for disease prevention and health promotion. An understanding of a global health system and its shortcomings, challenges and ways of addressing global public health challenges are explored. Importantly, helps learners to develop skills in critical thinking and problem solving in relation to health issues that cross geographical boundaries. Prereq: Jr. stndg.; and CLLS 2060 or BISC 4153.

**BISC 3213. Biochemistry. 4 cr. hrs.**

The chemistry of cells in health and disease. Structure and function of proteins, carbohydrates, lipids, and nucleic acids; enzyme function, cell signaling, cellular metabolism and biological information flow (molecular biology). Prereq: CHEM 2112 or CHEM 2114, which may be taken concurrently, or enrolled in the Biomedical Sciences Pre-Dental Post-Baccalaureate program.

**BISC 3850. Systems Neuroscience. 3 cr. hrs.**

Broad overview of neural systems supporting perception, learning, and behavior. Highly integrative with various thematic content including: functional organization of the nervous system, sensory and motor systems, neural encoding, motivation, emotion, learning and memory. Application of each topic to mental health is discussed. Applies toward the Anatomy and Systems Content Area. Prereq: BIOL 1001.

**BISC 3859. Evolution. 3 cr. hrs.**

Evolution consists of describing its history and analyzing its causes and mechanisms. Emphasizes the general principles of evolution, the hypotheses about the causes of evolutionary change that apply to the most organisms, and the major patterns of change that have characterized many different groups. Prereq: BIOL 1001 and BIOL 1002, a biochemistry course, and cons. of instr.

**BISC 3987. Internship in Biomedical Sciences-Work Period. 0 cr. hrs.**

Working period of a summer co-op or intern experience in an approved biomedical sciences related field. Features educational activity and productive work related to health care delivery or industrial or administrative aspects of health care. Prereq: Cons. of BISC internship director.

**BISC 3989. Research Internship in Biomedical Sciences-Work Period. 0 cr. hrs.**

Work period of summer, mentored research on a topic approved by Biomedical Sciences in an off-campus research laboratory. SNC/UNC grade assessment. Prereq: Cons. of dept. ch.

**BISC 4120. Pharmacology. 3 cr. hrs.**

Covers the fundamentals of human pharmacology and the basic principles dictating drug action within the human body. Focuses on the therapeutic actions and clinical applications of various drug classes with emphasis on cellular mechanisms, physiological responses, adverse reactions and clinical indications, accompanied by general discussion on the pathological conditions for which common therapeutic agents are used. Applies toward the Diseases and Pathology Content Area. Prereq: A course in biochemistry and BISC 4145; or enrolled in the Biomedical Sciences Post-Baccalaureate program; or cons. of instr.

**BISC 4140. Functional Neuroanatomy. 3 cr. hrs.**

Examines the basic structure and function of the central nervous system from spinal cord to cerebral cortex. Material is presented within both clinical and basic contexts. Based on the understanding of the normal circuitry and function of the brain, students progress towards developing the preliminary skills to diagnose or explain clinically relevant neurological disorders. Laboratory included. Applies toward the Anatomy and Systems Content Area. Prereq: BISC 3135 or BISC 7130.

**BISC 4142. Science and Society. 1 cr. hr.**

A discussion-based course focused on topics that are determined collaboratively, but may include human sexuality, mental and physical health, human evolution, race and identity and violence. Students integrate the knowledge gained from past course work to critically read and evaluate popular, journalistic and scholarly writing on topics related to human biology. Prereq: BISC Major, Jr. stndg.

**BISC 4142H. Science and Society. 1 cr. hr.**

A discussion-based disciplinary honors course focused on topics that are determined collaboratively, but may include human sexuality, mental and physical health, human evolution, race and identity and violence. Students integrate the knowledge gained from past course work to critically read and evaluate popular, journalistic and scholarly writing on topics related to human biology. As an Honors Program course, includes a more intensive research or project component. Prereq: Jr. stndg. and admission to BISC Disciplinary Honors Program.

**BISC 4145. Human Physiology. 4 cr. hrs.**

Human physiology including blood and circulation, muscular, neuronal and sensory systems, renal and respiratory systems, digestion, metabolism, reproduction, their control by the endocrine and central nervous systems, and clinical correlates. Prereq: BISC major, BISC 3135, and BISC 2070 or BISC 3213; or PHAS major.

**BISC 4146. Physiology In Depth: Contemporary Issues. 1 cr. hr.**

In depth treatment of selected topics in physiology with an emphasis on contemporary issues relevant to health and physiology. Prereq: BISC 4145.

**BISC 4146H. Honors Physiology In Depth: Contemporary Issues. 1 cr. hr.**

In depth treatment of selected topics in physiology with an emphasis on contemporary issues relevant to health and physiology. As an Honors Program course, includes a more intensive research or project component. Prereq: BISC 4145 and admission to BISC Disciplinary Honors Program.

**BISC 4147. Human Physiology Laboratory. 1 cr. hr.**

Uses virtual laboratory technology and a team-based learning approach to investigate fundamental concepts of human physiology. Clinical correlates are emphasized in a problem-based learning format. Prereq: BISC 4145, may be taken concurrently; cons. of instr.

**BISC 4150. Outbreaks, Epidemics and Pandemics. 3 cr. hrs.**

Through case studies, discussion, group work and service learning students develop an understanding of how infectious disease epidemics occur, what can be done to control them and why control efforts succeed or fail. By exploring the characteristics of pathogens and human hosts that contribute to disease spread, students gain the knowledge and skills to understand the implications of newly emerging pathogens and are able to advocate for what needs to be done to prevent outbreaks. Applies toward the Diseases and Pathology Content Area. Prereq: BISC 3115.

**BISC 4151. Advanced Pathology. 1 cr. hr.**

In depth coverage of selected topics in pathology, with an emphasis on current topics that are in the news and relevant to health and disease. Prereq: BISC 3150.

**BISC 4151H. Honors Advanced Pathology. 1 cr. hr.**

In depth coverage of selected topics in pathology, with an emphasis on current topics that are in the news and relevant to health and disease. As an Honors Program course, includes a more intensive research or project component. Prereq: BISC 3150 and admission to BISC Disciplinary Honors Program.

**BISC 4153. Epidemiology. 3 cr. hrs.**

An introduction to the basic concepts of epidemiology. The distribution and determinants of diseases in specified populations and the application to control of health problems. Emphasis is placed on epidemiologic study designs for investigating associations between risk factors and disease outcomes. Epidemiological approaches evaluate health services, population health and policy. Can apply to either the Health and Society cognate, or the BISC major electives, but not both. Prereq: BISC major or CLLS 2060 or HEAL 1025.

**BISC 4155. Diseases of the Brain. 3 cr. hrs.**

Primary objective is to better understand brain function by examining pathological states involving the central nervous system. In the process of developing a deeper understanding of the neurosciences, presented are opportunities to develop critical thinking skills, utilize the scientific method and explore how research investigates the complexity of brain function. Explores how deficits in cognition and other aspects of brain function provides insight into normal brain function and what it means to be human, by focusing on diseases of the brain. Applies toward the Diseases and Pathology Content Area. Prereq: BISC 3135.

**BISC 4160. Molecular Pathology. 3 cr. hrs.**

Cellular and molecular basis of human diseases, therapeutic interventions and current research efforts. Applies toward the Cell and Molecular Content Area or the Diseases and Pathology Content Area, but not both. Prereq: BISC major and a course in biochemistry, which may be taken concurrently; or cons. of instr.

**BISC 4165. Microbiology Laboratory. 1 cr. hr.**

Introduction to various topics of microbiology laboratory including the isolation, cultivation, enumeration and characterization of bacteria of human medical importance. Brightfield, darkfield and phase contrast microscopy are utilized. Specialized techniques include: antibiotic susceptibility testing, anaerobic cultivation and immunological assays. Prereq: BISC 3115 and cons. of instr.

**BISC 4170. Biology, Moral Behavior and Policy. 3 cr. hrs.**

A multidisciplinary course on moral decision making as it relates to public policy in healthcare. Examines the foundation of moral behavior and advances to the neural substrates of decision making with an emphasis on the learning, reward processing, and emotional systems that control behavior. Also incorporates discussions of specific ethical issues in biomedical sciences, paying particular attention to the nature of the dilemma and the voices guiding public policy. Can apply to either the Health and Society cognate, or the BISC major electives, but not both. Prereq: BISC 3135.

**BISC 4173. Principles of Human Embryology. 3 cr. hrs.**

System by system approach to the understanding of the sequence of human embryonic and fetal development. Early events include gametogenesis, implantation and placentation are covered to give a foundation for discussing the development of major organ systems. Discusses the underlying causes of morphological errors in the development which lead to congenital malformations. Stresses the effects of harmful (teratogenic) substances early in the developmental period. Provides a basic understanding of early inductive influences on major organ systems. Applies toward the Anatomy and Systems Content Area. Prereq: BIOL 1002 and BISC 3135.

**BISC 4210. Biology of Aging. 3 cr. hrs.**

Explore clinical, behavioral, genetic and cellular aspects of human aging from adolescence to senescence. Maintains a significant focus on neurobiology and scientific discoveries made from studies of model organism, which have led to revelations about the molecular biology of aging. Topics include cellular, physical and cognitive changes that occur during normal aging, as well as how age plays a role in the emergence of diseases such as Parkinson's, Alzheimer's, cancer, schizophrenia and depression. Prereq: BISC 4145.

**BISC 4214. Advanced Biochemistry. 1 cr. hr.**

Biochemistry is the body of knowledge upon which much of medical science is built. A living cell requires three things in order to maintain and propagate life: precursors, energy and information. Designed around the in depth examination of structure and function of selected precursors; how they are used to generate energy, store energy, or build more complex biomolecules; and how the information molecules control these processes. The topics covered depend on current health news and student interest. Prereq: BISC 3213.

**BISC 4214H. Honors Advanced Biochemistry. 1 cr. hr.**

Biochemistry is the body of knowledge upon which much of medical science is built. A living cell requires three things in order to maintain and propagate life: precursors, energy and information. Designed around the in depth examination of structure and function of selected precursors; how they are used to generate energy, store energy, or build more complex biomolecules; and how the information molecules control these processes. The topics covered depend on current health news and student interest. As an Honors Program course, includes a more intensive research or project component. Prereq: BISC 3213 and admission to BISC Disciplinary Honors Program.

**BISC 4275. Modern Plagues: Stress, Trauma and Addiction. 3 cr. hrs.**

Examines the biological underpinnings and consequences of stress, post-traumatic stress disorder and addiction and explores their interrelationships and societal impacts. Can apply to either the Health and Society cognate or toward the Diseases and Pathology Content Area, but not both. Prereq: BISC 4145 and cons. of instr.

**BISC 4325. Endocrinology. 3 cr. hrs.**

Introduction to the field of endocrinology. Focuses on understanding the endocrine system, principles of hormone regulation, hormone signaling mechanisms, and endocrine disorders. Topics include: reproduction, stress responses, metabolic function, growth and homeostasis. Applies toward the Anatomy and Systems Content Area. Prereq: BIOL 1002, and BISC 4145 or BIOL 3701.

**BISC 4340. Human and Applied Medical Genetics. 3 cr. hrs.**

Provides an overview of genetic principles that are relevant to human health and disease. Topics include: packaging and sequence architecture of the human genome, Human Genome Project, patterns of Mendelian inheritance in humans, development, genetic alterations and metabolic disease hemoglobinopathies, immunogenetics, genetic testing and gene therapy. Consists of didactic lectures with interspersed clinical cases. Intended for students interested in a career in medical professions. Applies toward the Cell and Molecular Content Area. Prereq: BISC 3213 or BIOL 4101; or PHAS major; or cons. of instr.

**BISC 4341. Advanced Cellular Genetics and Cancer. 1 cr. hr.**

A discussion-based focus on current advances in cellular genetics and cancer research. Students discuss current articles from the news or the primary literature related to the class topics. Includes a lecture component to provide background information for each topic. Prereq: BISC 4340.

**BISC 4341H. Honors Advanced Cellular Genetics and Cancer. 1 cr. hr.**

A discussion-based focus on current advances in cellular genetics and cancer research. Students discuss current articles from the news or the primary literature related to the class topics. Includes a lecture component to provide background information for each topic. As an Honors Program course, includes a more intensive research or project component. Prereq: BISC 4340 and admission to BISC Disciplinary Honors Program.

**BISC 4381. Politics of U.S. Health Care. 3 cr. hrs.**

Examines the American health care system, health care policies, and underlying politics. Provides an overview of the organization and financing of health care in the United States. Examines the impact of the political system, political parties and interest groups, and values on the health care system and health policies at national and state levels. Covers health care reform politics, including the Democrats' 2010 Affordable Care Act and Republican reform alternatives. Also focuses on the social determinants of health and policies for vulnerable populations. Same as POSC 4381. Prereq: Jr. stndg.

**BISC 4460. Practical Cases in Medicine. 3 cr. hrs.**

Provides an exciting opportunity to explore real-life, medical scenarios where students can apply the science they have learned throughout their undergraduate education to diagnose and develop treatment options. For each clinical case, students also examine how socio-cultural factors determine health outcomes. This experience is reinforced with service learning. Due to the medical nature of the clinical cases utilized in the course, preference is given to pre-medical and pre-physician assistant students. Applies toward the Diseases and Pathology Content Area. Prereq: BISC 4145 and cons. of instr.

**BISC 4461. Comparative Health Politics and Policy. 3 cr. hrs.**

Explores through comparative analysis the ways in which different nations address the goals of equitable access, affordability and quality in health care. Considers the similarities and differences in health policy challenges facing rich and developing nations. Employs comparative analysis of different models of health care provisions and financing, and examines the underlying politics of health care systems and policies in different countries. Same as POSC 4461. Prereq: Jr. stndg.; or enrolled in the Biomedical Sciences Post-Baccalaureate program.

**BISC 4514. Human Microanatomy. 4 cr. hrs.**

A study of the microscopic structure of cells, tissues and organs of the human body. Emphasis is placed on structure-function relationships and on the interaction of various cell types, tissues and organ systems. Includes laboratory. Prereq: BIOL 1001 and BISC 2135; or cons. of instr.

**BISC 4851. Advanced Systems Neuroscience. 1 cr. hr.**

Discusses current topics in neuroscience research to develop an appreciation for how neuroscientists unlock the mysteries of the brain to better understand human health and disease. Prereq: BISC 3850.

**BISC 4851H. Honors Advanced Systems Neuroscience. 1 cr. hr.**

Discusses current topics in neuroscience research to develop an appreciation for how neuroscientists unlock the mysteries of the brain to better understand human health and disease. As an Honors Program course, includes a more intensive research or project component. Prereq: BISC 3850 and admission to BISC Disciplinary Honors Program.

**BISC 4931. Topics in Biomedical Sciences. 1-3 cr. hrs.**

Selected topics in biomedical sciences. Specific topics will be designated in the Schedule of Classes.

**BISC 4931H. Honors Topics in Biomedical Science. 1-3 cr. hrs.**

Selected topics in biomedical sciences. Specific topics will be designated in the Schedule of Classes. Prereq: Cons. of dept. ch. and admission to BISC Disciplinary Honors Program.

**BISC 4953. Readings in Human Anatomy. 1 cr. hr.**

Explores and discusses primary literature in human gross anatomy and related fields. Students choose primary literature of interest and class sessions consist in student-lead discussions of weekly readings. Assignments include reflective writing and presentations. Prereq: BISC 3136.

**BISC 4953H. Readings in Human Anatomy. 1 cr. hr.**

Explores and discusses primary literature in human gross anatomy and related fields. Students choose primary literature of interest and class sessions consist in student-lead discussions of weekly readings. Assignments include reflective writing and presentations. As an Honors Program course, includes a more intensive research or project component. Prereq: BISC 3136 and admission to BISC Disciplinary Honors Program.

**BISC 4986. Internship in Biomedical Sciences. 1-3 cr. hrs.**

Co-op or intern experience in the biomedical industry. Features educational activity and productive work related to health care delivery or industrial or administrative aspects of health care. S/U grade assessment. Limited to a maximum of 6 credits with a maximum 3 credits applied towards the BISC major. Prereq: Cons. of dept. via Internship Director.

**BISC 4987. Internship in Biomedical Sciences-Grading Period. 1-3 cr. hrs.**

Working period of a summer co-op or intern experience in an approved biomedical sciences related field. Features educational activity and productive work related to health care delivery or industrial or administrative aspects of health care. S/U grade assessment. Limited to a maximum of 6 credits with a maximum of 3 credits applied toward the BISC major. Prereq: Cons. of BISC internship director.

**BISC 4988. Research Internship in Biomedical Sciences. 1-3 cr. hrs.**

Mentored research on a topic approved by Biomedical Sciences in an off-campus research laboratory. Can be taken for a maximum total of 6 credits, maximum of 3 credits can be applied toward BISC major. Prereq: Cons. of dept. ch.

**BISC 4989. Research Internship in Biomedical Sciences-Grading Period. 1-3 cr. hrs.**

Grading period of summer, mentored research on a topic approved by Biomedical Sciences in an off-campus research laboratory. Limited to a maximum of 6 credits with a maximum of 3 credits applied toward the BISC major. S/U grade assessment. Prereq: Cons. of dept. ch.

**BISC 4991H. Honors Community Engagement in Biomedical Sciences. 1-3 cr. hrs.**

Students are expected to not just be involved in community engagement, but to develop a new community engagement program. At the end of the term students give a PowerPoint presentation to the biomedical sciences faculty. A paper may be required by the faculty mentor. As an Honors Program course, includes a more intensive research or project component. Prereq: Admission to BISC Disciplinary Honors Program.

**BISC 4995. Independent Study in Biomedical Sciences. 1-6 cr. hrs.**

Research on a selected topic under the direction of a faculty member of the Department of Biomedical Sciences. Can be taken for a maximum total of 6 credits, maximum of 3 credits can be applied towards BISC major. Prereq: Cons. of dept. ch.

**BISC 4995H. Honors Independent Study in Biomedical Sciences. 1-6 cr. hrs.**

Research on a selected topic under the direction of a faculty member of the Department of Biomedical Sciences. Can be taken for a maximum total of 6 credits, maximum of 3 credits can be applied towards BISC major. As an Honors Program course, includes a more intensive research or project component. Prereq: Cons. of dept. ch. and admission to BISC Disciplinary Honors Program.

**BISC 4997H. Capstone for Disciplinary Honors Program in Biomedical Sciences. 1 cr. hr.**

Designed to assist the student in reflecting on the entirety of their honors experience and generating a comprehensive presentation of that experience. As an Honors Program course, includes a more intensive research or project component. Prereq: Admission to BISC Disciplinary Honors Program.

**BISC 7001. Principles of Dentistry. 1 cr. hr.**

Surveys the dental profession from the perspectives of participating clinicians, residents and students. Included is an introduction to clinical specialties, procedures, practice settings, as well as alternatives to clinical practice. Prereq: Enrolled in the Biomedical Sciences Pre-Dental Enhancement program.

**BISC 7002. Dental Health and Society. 1 cr. hr.**

An introduction to the field of dentistry with an emphasis on how it can impact an individual's overall health and address dental health disparities in the country. Prereq: Enrolled in the Biomedical Sciences Pre-Dental Post-Baccalaureate program.

**BISC 7005. Professional Development 1. 0 cr. hrs.**

Designed to focus on and improve the skills necessary for a successful application to dental school or other graduate/career path upon completion of the program. Focuses on the application building aspect within career development. SNC/UNC grade assessment. Prereq: Enrolled in the Biomedical Sciences Post-Baccalaureate certificate program.

**BISC 7006. Professional Development 2. 0 cr. hrs.**

Designed to focus on and improve the skills necessary for a successful application to dental school or other graduate/career path upon completion of the program. Focuses on the interview skill aspect of career development. SNC/UNC grade assessment. Prereq: Enrolled in the Biomedical Sciences Post-Baccalaureate certificate program.

**BISC 7007. Professional Development 3. 0 cr. hrs.**

Designed to focus on and improve the skills necessary for a successful application to dental school or other graduate/career path upon completion of the program. Focuses on the transition from the post-baccalaureate program to the student's future goals. SNC/UNC grade assessment. Prereq: Enrolled in the Biomedical Sciences Post-Baccalaureate certificate program.

**BISC 7021. Medical and Dental Terminology. 1 cr. hr.**

Provides a foundation for the understanding and use of common terminology in the medical field, with particular emphasis on dentistry. Designed to introduce basic prefixes, suffixes, and word roots, and their combining forms, as well as advanced clinical terminology specific to the dental profession. Prereq: Enrolled in the Biomedical Sciences Pre-Dental Post-Baccalaureate program.

**BISC 7130. Human Gross Anatomy. 5 cr. hrs.**

A human gross anatomy course including lecture and a cadaver dissection laboratory. Anatomy of the limbs, back, thorax, abdomen, pelvis, and head and neck is approached on a regional basis. Lectures emphasize regional anatomical relationships, functional aspects of the systems, and provide a guide to the dissections. Applies toward the Anatomy and Systems Content Area, but only 3 of the 5 credits apply toward the 33 credits required for the major. Prereq: PHTH major; or PHAS major only.

**BISC 7150. Outbreaks, Epidemics and Pandemics. 3 cr. hrs.**

Through case studies, discussion, group work and service learning students develop an understanding of how infectious disease epidemics occur, what can be done to control them and why control efforts succeed or fail. By exploring the characteristics of pathogens and human hosts that contribute to disease spread, students gain the knowledge and skills to understand the implications of newly emerging pathogens and are able to advocate for what needs to be done to prevent outbreaks. Applies toward the Diseases and Pathology Content Area. Prereq: Enrolled in the Biomedical Sciences Pre-Dental Enhancement program.

**BISC 7153. Epidemiology. 3 cr. hrs.**

An introduction to the basic concepts of epidemiology. The distribution and determinants of diseases in specified populations and the application to control of health problems. Emphasis is placed on epidemiologic study designs for investigating associations between risk factors and disease outcomes. Epidemiological approaches evaluate health services, population health and policy. Can apply to either the Health and Society cognate, or the BISC major electives, but not both. Prereq: Enrolled in the Biomedical Sciences Post-Baccalaureate certificate program.

**BISC 7160. Foundations in Public Health. 3 cr. hrs.**

Exploration of select public health issues with an emphasis on dental health disparities. Service learning experiences are incorporated to further the student's integration of public health issues with the dental profession. Prereq: Enrolled in the Biomedical Sciences Pre-Dental Post-Baccalaureate program.

**BISC 7180. Clinical Neuroanatomy. 3 cr. hrs.**

Fundamental neurocranial anatomical information essential to the practice of medicine. Students develop a 3-dimensional understanding of neurocranial structures, and their relationships, with an emphasis on critical thinking through clinical problem solving. Prereq: PHAS major or cons. of instr.

**BISC 7213. Clinical Biochemistry. 4 cr. hrs.**

Examines biochemistry of human cells. Examines the chemistry of amino acids, proteins, carbohydrates, lipids, and nucleic acids. Explores the metabolism and metabolic regulation of these molecules, as well as changes in disease states. When necessary, compares and contrasts human biochemistry with that of bacterial cells. Prereq: General and organic chemistry and enrolled in the Biomedical Sciences Pre-Dental Post-Baccalaureate program.

**BISC 7215. Clinical Microbiology with Lab. 4 cr. hrs.**

Focuses on the general biology of bacterial, viral, fungal and parasitic pathogens of human medical importance and the response of the human host. Laboratory sessions reinforce content from lectures and introduce students to laboratory skills including isolation, cultivation, enumeration, and characterization of bacteria of human medical importance. Utilizes Brightfield microscopy. Specialized techniques include antibiotic susceptibility testing, anaerobic cultivation, biochemical tests and immunological assays. Prereq: Enrolled in the Biomedical Sciences Pre-Dental Post-Baccalaureate program.

**BISC 7220. Medical Pharmacology. 4 cr. hrs.**

Fundamentals of human pharmacology and basic principles dictating drug actions within the human body with emphasis on applications in general medicine. Focuses on the therapeutic actions and clinical applications of various drug classes. Topics include: cellular mechanisms, physiological responses, adverse reactions, drug-drug interactions, and clinical indications, accompanied by discussion on the pathological conditions for which common therapeutic agents are used. Applications of pharmacology commonly encountered by physician assistants are presented and are reinforced through interactive clinically correlated lectures presented by practicing physicians and physician assistants. Prereq: BISC 4145 and PHAS major.

**BISC 7235. Principles of Dental Gross Anatomy. 3 cr. hrs.**

Provides students with a foundation in human anatomy, with focus on regions most relevant to dental medicine. Emphasizes correlations between structure, function, and clinical application. Includes laboratory. Prereq: Enrolled in the Biomedical Sciences Pre-Dental Post-Baccalaureate program.

**BISC 7410. Microbiology. 4 cr. hrs.**

Focuses on infectious agents of human medical importance and on the host pathogen interaction. Topic areas include: the general characteristics of bacteria, viruses, fungi and parasites as well as the etiology, pathogenesis, laboratory identification and epidemiology of selected diseases. Control of microorganisms is discussed in terms of sterilization, disinfection, chemotherapy and immunization. The immune system and the immune response are discussed. Applies toward the Cell and Molecular Content Area. Prereq: School of Dentistry or PHAS major.

**BISC 7514. General Histology. 4 cr. hrs.**

This course is a study of the normal microscopic structure and function of human cells, tissues and organs. The structural basis for various physiological and pathological processes such as inflammation and endocrine cycles is presented. The student is also introduced to tissues of the oral region that are studied in detail in DENT 7121. Laboratory exercises promote visual identification of structure. Prereq: School of Dentistry only.

**BISC 7515. Biomedical Systems 1. 3 cr. hrs.**

Provides an introduction to human anatomy of the head and neck region. Topics include the skull, temporomandibular joint, muscles of mastication and facial expression and an overview of the orbital and cervical regions. Structural and functional relationships between the cranial nerves and central neuroanatomical pathways are presented along with selected clinical correlations. Begins to build the foundational knowledge of the biomedical systems that is necessary for dental students as they start patient rounds during the first semester. Applies toward the Anatomy and Systems Content Area. Prereq: School of Dentistry.

**BISC 7516. Biomedical Systems 2. 4 cr. hrs.**

A human gross anatomy course for dental students that integrates lecture with a cadaver dissection laboratory. Follows the neurocranial anatomy course with expanded topics and detailed dissections of the head and neck regions. Lectures and dissections of the thorax, abdomen and pelvis, along with lectures on the upper and lower extremities are included. Part of a biomedical systems course sequence integrating anatomy, physiology, pathology, and dental clinical correlates. Prereq: School of Dentistry only.

**BISC 7517. Biomedical Systems 3. 4 cr. hrs.**

Module 3 of a systems-based course integrating anatomy, physiology and pathology including dental clinical correlates. Prereq: School of Dentistry only.

**BISC 7518. Biomedical Systems 4. 4 cr. hrs.**

Module 4 of a systems-based course integrating anatomy, physiology and pathology including dental clinical correlates. Prereq: School of Dentistry only.

**BISC 7520. Dental Pharmacology. 4 cr. hrs.**

Fundamentals of human pharmacology and basic principles dictating drug actions within the human body with emphasis on applications in dentistry. Focuses on the therapeutic actions and clinical applications of various drug classes. Topics include: cellular mechanisms, physiological responses, adverse reactions, drug-drug interactions, and clinical indications, accompanied by discussion on the pathological conditions for which common therapeutic agents are used. Applications of pharmacology commonly encountered by dentists are presented and are reinforced through interactive clinically correlated lectures presented by dental professionals. Prereq: School of Dentistry only.

**BISC 7550. Remediation. 0-6 cr. hrs.**

Variable credits. Variable titles. 0 credit will be SNC/UNC grade assessment; 1-6 credits will be graded. Prereq: Cons. of dept. ch. only.

**BISC 7931. Topics in Biomedical Sciences. 1-3 cr. hrs.**

Selected topics in biomedical sciences. Specific topics will be designated in the Schedule of Classes.

**BISC 7995. Independent Study in Biomedical Sciences. 1-6 cr. hrs.**

Research on a selected topic under the direction of a faculty member of the Department of Biomedical Sciences. Can be taken for a maximum total of 6 credits, maximum of 3 credits can be applied towards BISC major.

**BISC 9002H. Honors Student Study/Research Placeholder in Biomedical Sciences. 0 cr. hrs.**

Used to enroll a honors student who is not enrolled in the term, but is on campus for an educational experience other than academic credit, such as work in a lab or clinic. Used for tracking purposes only. SNC/UNC grade assessment. Prereq: cons. of dpt. ch.