GVSU PSM Health and Bioinformatics Curriculum Suggested

Course Sequence for Students with Life Science Background

Start in Winter Semester

Winter Semester- Year One	Credits	Fall Semester- Year One	Credits
CIS 671: Information Visualization	3	PSM 650: Ethics & Professionalism (online)	3
CIS 161: Computational Science (background Course)	(3)	STA 610-01: Applied Statistics for Health Professions	3
CIS 661: Intro to Health and Bioinformatics	3	*-or-* STA 622: Applied Statistics for Biologists	3
		CIS 660: Information Management and Science	3
Total	**6+(3)**	**Total**	**9**
Winter Semester- Year Two	**Credits**	**Spring/Summer - Year Two**	**Credits**
CIS 691: Health and Bioinformatics Capstone	3	PSM 691: Internship	4
CIS 635: Knowledge Discovery and Data Mining	3	**Total**	**4**
CIS 678: Machine Learning*	3		
-or- PNH 630: Health Administration and Service**	3		
Total	**6+3**		
Fall Semester- Year Two	**Credits**		
PSM 662: Seminar in Professional Science	2		
CMB 610: Foundations of Biotech	3		
CIS 677: High-Performance Computing*	3		
-or- CIS 665: Clinical Information Systems**	3		
Total	**5+3**		
Total Credits for the program:	**36**		

*Indicates courses required for emphasis in Bioinformatics
**Indicates courses required for emphasis in Health Informatics

Graduate Course Offerings by Semester

Fall Courses	Credits	Winter Courses	Credits
CMB 610: Foundations of Biotech	3	CMB 610: Foundations of Biotech	3
CIS 500: Fundamentals of Computer Science	3	CIS 635: Knowledge Discovery and Data Mining	3
CIS 661: Intro to Health and Bioinformatics	3	CIS 661: Intro to Health and Bioinformatics	3
CIS 665: Clinical Information Systems	3	CIS 671: Information Visualization	3
CIS 677: High-Performance Computing	3	CIS 678: Machine Learning	3
PNH 630: Health Administration and Service	3	CIS 691: Health and Bioinformatics Capstone	3
PNH 635: Hospital Organization and Management	3	PNH 630: Health Administration and Service	3
PSM 650: Ethics & Professionalism	3	PSM 650: Ethics & Professionalism	3
PSM 662: Seminar in Professional Science	2	PSM 662: Seminar in Professional Science	2
PSM 691: Internship	1-4	PSM 691: Internship	1-4
STA 610-01: Applied Statistics for Health Professions	3		
STA 622: Statistical Methods for Biologists	3		

Spring/Summer Courses	
CIS 661: Intro to Health & Bioinformatics	3
PSM 650: Ethics & Professionalism	3
PSM 662: Seminar in Professional Science	2

Course Descriptions

CMB 610 Foundations of Biotechnology. Introduction to the methods and strategies used for the manipulation of biological systems to produce food, drugs, and other products. Topics include experimental systems, gene and protein analysis, genetic engineering, recombinant DNA technology, transgenic organisms, gene therapy, and plant biotechnology. Prerequisites: Admission to a professional science master's program. Three credits.

CIS 161 Computational Science. Computational science is the field of study concerned with using computers to analyze, model, simulate, and solve problems in various mathematical and scientific disciplines. Offered winter semester. Four Credits

CIS 162 Computational Science I. Introduction to programming and computer science through lab and lecture. Simple and structured data types and program control structures. Problem analysis, algorithm design, and computer implementation using a high-level language. Offered every semester. Four credits.

CIS 500 Fundamentals of Computer Science (background Course)**.** Focuses on the advanced programming concepts, common data structures, and basic models that students of Computer Science and Information Systems need to know. Elements of discrete mathematics are integrated through lectures and programming projects. Prerequisite: need overwrite. Contact Program Chair. Three Credits.

CIS 660 Information Management and Science. An introduction to information modeling, retrieval, analysis, visualization and science as applied to complex content at a large-scale. Information access and utilization within the context of a commonly used database, management, and analysis systems. Prerequisites: CIS 500 or CIS 661. Three credits

CIS 661 Introduction to Health & Bioinformatics. A survey of fundamental concepts of health and bioinformatics methods and techniques involved in the integration of computer systems in medicalcenters and life science industries. Introduction to biomedical information systems; data representation, modeling, management and mining; systems evaluation; project management practices for biomedical decision making. Legal and ethical considerations. Three credits.

CIS 665 Clinical Information Systems. Historical development of clinical information systems, including hospital information systems and community health information systems. Topics coveredinclude: clinical information systems and health informatics, components of clinical information systems, examples of clinical information systems. Offered fall semester. Prerequisites: CIS 661. Three Credits.

CIS 671 Information Visualization. Concepts of information visualization, principles in vision and perception, algorithms for building information spaces, and principles of user interface design. Case studies demonstrate information visualization used to solve specific retrieval and decision problems for biological data. Evolution of visual user interfaces and visualization tools, visual information retrieval andknowledge representation. Prerequisites: CIS 500 or equivalent. Three credits.

CIS 677 High-Performance Computing. Introduction to parallel and high-performance computing. Coverage Includes modern scalable parallel and distributed architectures, design and analysis of algorithms, communication and synchronization issues, software development environments, and performance evaluation. Case studies include applications in bioinformatics, evolutionary computing, data mining of biological and clinical databases, and knowledge-based systems. Prerequisite(s): CIS 500 or equivalent. Three Credits.

CIS 678 Machine Learning. Broad introduction to machine learning computer programs that improve their performance with experience. Topics include decision trees, neural networks, statistical methods, genetic algorithms, Bayesian learning methods, explanation-based goal regression, reinforcement learning, and learning frameworks. Includes an applied machine learning component that provides exposure to established algorithms and machine learning programs. Offered winter semester. Prerequisites: CIS 500 or equivalent. Three credits.

CIS 691 Health and Bioinformatics Capstone. An integrative capstone that synthesizes topics coveredin Health/Bioinformatics. Promotes advanced writing and broad perspectives of issues in contemporary information systems. Students will demonstrate ability to integrate concepts to a practical situation byleading discussion and presenting a paper on a current topic. Offered fall semester. Prerequisites: Completion of Directed Courses in Health and Bioinformatics. Three Credits.

STA 610-01 Applied Statistics for Health Professions. Only section 01 qualifies! Project-oriented overview of major statistical techniques commonly used in problems encountered in health professions. Students will learn to use a major statistical computing package. Hypothesis testing, t-tests, regression, analysis of variance, analysis of covariance, categorical data analysis, nonparametric statistics. Offered fall, winter, and spring/summer semesters.

STA 622 Statistical Methods for Biologists. Design of experiments and application of statistical techniques commonly used by biologists. Emphasis on techniques for count data, correlation and regression, analysis of variance, multivariate analysis, and nonparametric methods using biological data. A computing package will be utilized throughout the course. Offered fall semesters.

PNH 630 Health Administration and Services. Overview of the current management, organization, and delivery of U.S. health care. Current management and organization theories are compared in relation to the health care system. Major system components are defined and studied. Included are discussions of staffing, dealing with internal and external constituencies, and identification of hospital types. Three credits.

PSM 650 Ethics and Professionalism in Applied Science. Ethical and professional issues and problems facing practicing scientists. Emphasizes and role of scientists in public and private sectors, their responsibilities, and emerging ethical and professional issues. Offered winter and spring/summer semester. Prerequisites: Admission to a professional science masters (PSM) program. Three Credits.

PSM 662 Seminar in Professional Science Practice. Seminar course designed to broaden the student's professional foundation in the practice of applied sciences. Offered Fall and Spring/summer semesters. Two credits. Prerequisites: Admission to a professional science masters (PSM) program. Two Credits.

PSM 691 Internship. Full-time or part-time, on-the-job work performed at a sponsoring entity while under the supervision of an approved mentor in an area related to applied sciences. Prerequisites:Satisfactory completion of PSM common core courses and program-specific courses. One to nine credits (4 are required). Offered every semester.