

# CREATE YOUR OWN WORLDS

## GAME DESIGN & DEVELOPMENT

### Academic Senate Executive Summary

# Bachelors of Science in Game Design & Development

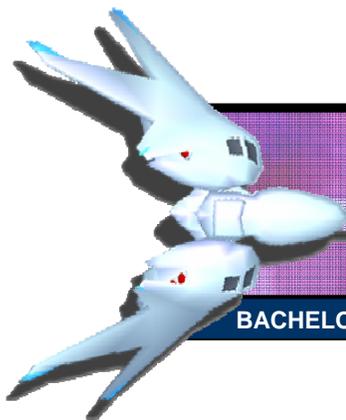
B. Thomas Golisano College of Computing & Information Sciences  
Rochester Institute of Technology



**Academic Year 2006-2007**  
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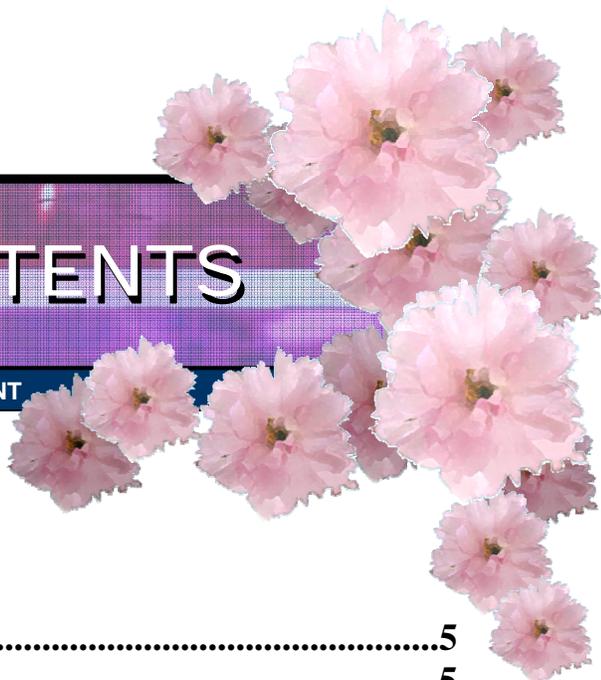
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## I. Purpose of this document

This document offers an executive summary of the materials found in the full proposal for the Bachelors of Science in Game Design and Development. The full proposal is constructed around the proposal format prescribed by the RIT Provost's Office, and has strong overlap with the proposal format for the New York State Office of Education. This document is specifically prepared for members of the RIT Academic Senate as a succinct version of the full proposal, created specifically to expedite the process of discussion and review. The entire proposal document, as well as any and all supplementary documentation, is available for review either by request or at the Academic Senate Office.

It is our sincere hope that you will find the proposed program to be an outstanding addition to the already incredible collection of programs available at the Institute. Reviewers seeking responses to specific questions are encouraged to contact either Andrew Phelps or Dr. Christopher Egert directly, at any time, using the following contact information:

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## II. Introduction & Program Summary

The Bachelors of Science in Game Design and Development defines a program of study that allows students to explore the entertainment technology landscape as well as other related areas, while still pursuing a broad-based university education. The program focuses its technical roots in the Computing and Information Sciences disciplines. Simultaneously, the program exposes students to the breadth of development processes through involvement in topics such as game design, design process, and animation.

The program is characterized by a clear focus on development, but meets the industry need for developers that will be involved in the design process from the beginning, just as they are in the professional field. The degree is intended specifically for students that aspire to hold careers within the professional games industry or a related field such as simulation, edutainment or visualization, and focuses on producing graduates that understand the technical roots of their medium, the possibilities that creative application of software development affords, and the way in which their industry operates. This degree also provides students with a core computing education that would prepare them for graduate study in a number of computing fields, and employment in more general computing professions.



The program is a 4-year undergraduate program (5-year due to co-op experience) in which students complete a “**core**” of required coursework, and then pursue a block of coursework in “**advanced studies**” that is customizable to their individual interests and career goals. In addition, all students will complete coursework in the liberal arts, the social sciences, and the laboratory sciences in keeping with the long-standing traditions of a traditional university degree. Students can further customize their experience through both general elective coursework and free electives.

This degree represents a core partnership between the departments of Information Technology and Computer Science within the B. Thomas Golisano College of Computing and Information Sciences, and involves additional offerings and support from the College of Imaging Arts and Sciences. This proposed degree resonates with the core focus of the Rochester Institute of Technology with respect to career-oriented education, and it is well integrated and situated with other programs within the College of Computing. This degree seeks to strike the appropriate undergraduate balance between specialization and general study, offering its students a specific course of study while still providing a well-rounded technical education. It is particularly well suited to prepare students for further study in the RIT Masters of Science in Game Design and Development.

## ***A. Computer Game Design and Development Industry Statistics***

The computer games industry produces software for home computers, game machines, on-line games, and arcade games, as well as console hardware, portable game platforms, and mobile multi-function devices. In 2004, the industry realized sales of between \$7.3 billion and \$8.2 billion for software in the United States alone (Entertainment Software Association, 2005; PricewaterhouseCoopers, 2005a). The sale of associated hardware brings this figure closer to \$18.1 billion, not including the segment of the PC market hardware that is directly tied to games (Plunkett Research, 2005). On a global scale, the sale of video game software reached record levels of \$25.4 billion (PricewaterhouseCoopers, 2005a). In addition, the number of game unit sales made to consumers also reflects the strength of the gaming industry. Estimates for 2004 indicate that the industry sold 248 million software units within the United States for personal computer and console systems (Entertainment Software Association, 2005). Estimates place the number of jobs in the areas of computer game design and development at 100,000 employees in North America (Bass, 2005). This figure does not include the number of jobs associated with the distribution, marketing, and sales of computer game technology, nor does it include ancillary professions that could be classified in the broader area of entertainment technology production.

## ***B. Breadth and Scope of Game Design and Development Industry***

Perhaps, even more important than the size of the industry is its breadth and scope. Computer games in all forms are, in fact, quite complex and serve as a rich and colorful form of entertainment to a variety of audiences. Games come in a variety of genres, including sports titles, educational games, strategic simulations, historical and military reenactment, cooperative games, science fiction and fantasy titles, construction-based games, and social interaction titles,



as well as games that allow users to enact traditional war games. For the year 2004, market research indicated that 75% of all American heads of households were computer game players, and 43% of those surveyed were women (Entertainment Software Association, 2005). Those surveyed ranged in age from 5 to 65, with an average age of 30 across all game genres. In addition, over 203 million game console units were sold within the United States in 2004 (Entertainment Software Association, 2005). The demand for game console software has also kept pace with hardware sales, with 52 console software titles selling in excess of 500,000 units each (Entertainment Software Association, 2005). In all, the average game player will spend between 7.4 hours on average for women and 7.6 hours for men per week playing video games (Entertainment Software Association, 2005). Over 47% of Americans surveyed plan to buy at least one video game in 2005 (Entertainment Software Association, 2005). The prolific nature of games has even caused Hollywood to take notice, since games have become a contender for consumer box office dollars (Holsen, 2004; Wong, 2004).

### ***C. Projected Growth of Game Design and Development Industry***

Sales of games and game-related hardware have continued to grow each year, despite economic downturns in nearly every other market segment. Current projections forecast a global growth rate in software sales of 16.5% compounded annually through 2009 (PricewaterhouseCoopers, 2005a). Facets of the game industry with the potential for explosive growth rates include wireless (cell phone, wireless PDA's, etc.) game software sales, projected at 49.3% compounded annually through 2009 (PricewaterhouseCoopers, 2005a), as well as consumer demand for online multi-player gaming experiences, with a projected consumer subscription spending increase of approximately 35% compounded annually through 2009 (PricewaterhouseCoopers, 2005b).

### ***D. Academic Significance of Game Design and Development***

Games are steadily becoming the subject of academic interest. This status is not due to dollars generated alone. Media theorists and academics around the world are evaluating computer games in peer-reviewed journals, such as the *Journal of Game Development* (Charles River Media, 2005) and *IEEE Computer Graphics and Applications* (IEEE Press, 2005), and at internationally recognized peer-reviewed academic conferences, such as ACM's Special Interest Groups in Computer Graphics and Interactive Techniques (SIGGRAPH) (Association for Computing Machinery, 2005b) as well as in Computer Human Interaction (SIGCHI) (Association for Computing Machinery, 2005a), and the Academic Summit that meets annually at the Game Developers Conference (CMP, 2005). Many publishers respected in the academic community, including MIT Press, Addison-Wesley, Morgan-Kaufman, Premier Press and Charles River Publishing, are offering academic-quality textbooks.

The academic study of game design and development as a discipline has also challenged the traditional social, cultural, and psychological roles that games play in daily life. For example, the Serious Games Initiative (Serious Games Initiative, 2005) and its related conference challenge academics and industry leaders to explore the use of games in the fields of health, management, education, social interaction and behavior, training, and public policy. Even the



defense industry has acknowledged the opportunity for research collaboration with the game development community (Capps, McDowell, & Zyda, 2001).

The viability of games as an area of academic pursuit is also being explored by the International Game Developers Association (IGDA) (IGDA, 2005). In particular, the IGDA Education Committee has spent the last several years designing a model curriculum for the study of games and games development (IGDA Education Committee, 2003). The resulting document has been refined by the education committee and discussed at such prominent academic conferences as SIGGRAPH. Furthermore, the results of the committee's document were instrumental in the creation of an academic quality textbook on introductory game development (Rabin, 2005). Other societies and their related conferences, such as the Digital Games Research Association (DiRGA) (DiRGA, 2005), also promote a teaching and research agenda for game theory and its practical application.

## ***E. Careers in Game Design and Development as well as Related Fields***

There are a wide variety of careers available in the games industry as shown by this partial list, taken from *Get in the Game: Careers in the Games Industry* and other sources (Hoekstra, 2000; Mencher, 2002; Olsen, 2004). Several students who have completed our existing undergraduate curriculum in game programming have gone on to pursue careers such as listed below and have been hired by several companies, including Microsoft, Sony, Electronic Arts, Linden Labs, and Vicarious Visions.

### **1. Sample List of Game Design and Development Career Opportunities**

Game Designer	Technical Artist / Art Integration Specialist
Level Designer	Game Producer
Programmer	Game Network Engineer
Lead Programmer	System Administrator
2D/3D/Graphics Programmer	Playability Tester / Game Usability Specialist
Artificial Intelligence Programmer	Quality Assurance Technician
Audio Programmer	Game Design Document Creator/Writer



## 2. Sample List of Career Opportunities Related to Game Design and Development

It is interesting to note the relationship that games have to the larger context of multi-user and/or real-time application development. The technology for games currently drives a significant portion of the technology used in scientific and data visualization, from graphics hardware to engine algorithms to technologies for multiple simultaneous users. Games and game technologies are currently used in many environments to support education on topics ranging from high-school science and biology to the study of computer programming. Games in fact overlap with a variety of fields, as shown in part in Figure 1. The technology is related to that used for simulation, visualization, collaborative engineering, and interactive systems. Games are created with building blocks from fields such as artificial intelligence, graphics, mathematics, art and design, and literature. They are similar in some respects to film as an artistic medium, have overlap with traditional painting, drawing, and music, and have direct ramifications on the study of psychology, sociology and popular culture.

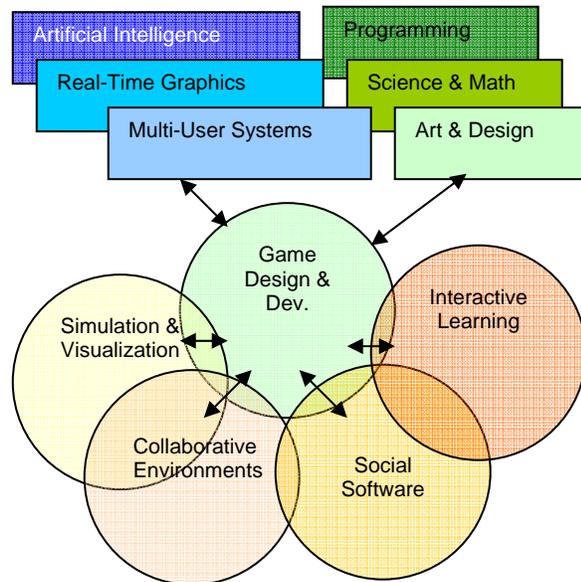


Figure 1: An extremely non-comprehensive list of overlap between Game Design & Development and existing fields of research.

Thus, there are career opportunities that are related to game design and development, and previous students who completed our existing undergraduate game curriculum have gone on to pursue careers in several of these related industries. These related career areas include:

- Scientific Interactive Visualization System Design
- Military Simulation and Training Systems Development
- Educational Systems Development
- Collaborative Software Experience Designer for Social Interactions
- Network Application Developer for Massively Multi-User Interactive Experiences
- Augmented Reality System Developer
- Related Entertainment Technology Disciplines
  - Developer of Applications and Plug-ins for Image, Video, and Audio Experiences
  - Development of Media Kiosks and Game-like Experiences for Physical Entertainment and Commercial Facilities



## ***F. Degree Relevance and Overview***

The economic viability of the games industry, the interdisciplinary nature and complexity of the skills required to create good games, as well as the desire of many university students to enter the games industry make this program a timely addition to the RIT curriculum. Programs related to this area are already available at several universities at a graduate level, including Carnegie Mellon, Purdue, Georgia Tech, University of Southern California, and University of California, San Diego. Several institutions have also endeavored to create viable undergraduate degrees, minors, and concentrations, including Rensselaer Polytechnic Institute, Worcester Polytechnic Institute, University of Southern California, and University of Colorado.

The proposed Bachelors of Science in Game Design and Development embodies the original vision of the Golisano College of Computing and Information Sciences (GCCIS) through the synergistic combination of its departments. The degree will involve faculty and courses (most of which already exist) from both the Information Technology and Computer Science Departments in GCCIS, as well as from the School of Film and Animation in the College of Imaging Arts and Sciences (CIAS). As a result of the multidisciplinary nature of the program's faculty, the program can support solid theoretical, technology-based and artistic tracks. The program will be physically housed within the Information Technology Department and will make use of their administrative support staff and advising offices.

The proposed degree is designed as a **four-year** undergraduate program with a required **three-quarter** cooperative education requirement. Students will be admitted to the program through the normal undergraduate admissions process. Student admittance will be based upon a combination of high school grade and rank, SAT scores, ACT scores, and letters of reference.

Students are required to complete a game design and development core, which provides breadth in the field of computing as well as an introduction to game design and development as an academic discipline. Along with the game design and development core, students are required to take a computer animation core, which exposes them to the artistic requirements that are necessary for understanding the intersection of creative and technical design. Students will also be required to specialize by selecting five courses for advanced studies. Courses related to advanced studies will be selected with the guidance of game design and development faculty and advising staff, and will allow the student to focus in such areas as game engine design, casual and serious games, web games, artificial intelligence, graphics, collaborative game experiences, as well as audio and database programming. Students will also be required to participate in a freshman seminar experience, designed to introduce them to the field they have selected as their future career.

Along with the program requirements, students must complete courses that are the cornerstone of an RIT education. Students will be required to take both core and concentration liberal arts courses, science and math courses, general education electives, free electives, as well as physical education courses.

The Game Design and Development program also requires students to participate in three quarters of cooperative education experience. Cooperative education is the hallmark of an RIT



education and provides experiences that help a student understand the career field they have selected as well as how to hone their skills for the future. Many industry leaders in the game design and development field already come to RIT to take advantage of cooperative education students produced by the game concentration within the Information Technology department. With the arrival of this proposed program, this relationship will only strengthen.



# III. Curriculum

## A. Curriculum Overview

The following section details the courses and credits that comprise the Bachelors of Science in Game Design and Development proposed program. In all, the proposed degree requires 181 credits to complete, and the course requirements can be classified into ten categories, including game design and development core, computer animation core, advanced studies, student seminars, liberal arts, science and mathematics, general education, free electives, physical education, and cooperative education. Each course area is presented in the sections below. A sample worksheet for this program is included in Figure 2.

### 1. Game Design and Development Core

The game design and development core consists of fifteen program courses totaling sixty credit hours. The game design and development core endeavors to provide students with appropriate background for a career in game design and development while still providing a solid computing education. Introductory courses include an introduction to multimedia, an introductory programming sequence, an introduction to multimedia programming, database modeling, and networking essentials. The core's intermediate classes provide increased specialization for computing topics, including intermediate programming for digital media, Visual C++ programming, human factors, and web design and implementation. The intermediate level also introduces students to the fundamentals of game design and development as a discipline as well as introduces them to critical data structures and algorithms often encountered in the construction of game systems. Advanced core classes continue the exploration of game design and development as well as the further study of data structures and algorithms for games.

It should be noted that the game design and development core takes advantage of introductory programming courses within the Department of Computer Science. These courses are special in that they are based upon work by Professor Jessica Bayliss in the use of game programming as a computing domain for introductory computing education. The use of these courses is documented in Appendix A and will represent collaboration between the Information Technology Department and the Department of Computer Science. In addition, the introductory programming sequence will provide students with coverage for three general elective courses. This is based upon existing practice within the Information Technology department for the introductory sequence.

### 2. Computer Animation Core

In order to help students understand the intersection of arts and technology as it applies to game design and development, a requirement of two fine arts courses from the School of Film and Animation from the College of Imaging Arts and Sciences has been included in the program core. The courses introduce the student to basic principles in animation and the art of 3D scene construction, using industry standard tools and processes. Even if the student does not wish to



design art and animation as part of his/her career path, the understanding of these principles is essential to the industry. The failure of technicians and artists to understand each other's concerns and process is often cited as a critical cause of problems within the development process (Grossman, 2003). The agreement between the Game Design and Development program, the College of Imaging Arts and Sciences, and the School of Film and Animation can be found in Appendix A.

### **3. Advanced Studies**

Students will be required to select five program elective courses from sixteen (16) offerings to satisfy the requirements of advanced studies. Totalling twenty credit hours, the advanced studies provide specialization within the game design and development program. With the guidance of game design and development faculty, as well as the advisement teams, courses can be selected to represent the student's interest within the game design and development industry. Courses can be combined such that students can focus upon areas such as game engine design, casual and serious games, web games, artificial intelligence, graphics, collaborative game experiences, as well as audio and database programming. In addition, advanced studies can be combined with a student's free elective selection to provide a deeper focus within the technical side of the discipline.

### **4. Seminars**

Students are required to take three seminars totaling three credit hours. All students matriculated into the program will be placed into a section of freshman seminar specifically tailored for the game design and development program. Students will take this course in their first quarter of study. In addition, all students will be required to take two quarters of First Year Experience (FYE), as required of all students by the Institute.

### **5. Liberal Arts**

Students in the Game Design and Development program are required to take thirty-six credit hours of liberal arts courses. Students are required to take six core courses, including a writing course, two humanities core courses, two social sciences core courses, and a course in arts of expression. Students are also required to take a three-course liberal arts concentration. Acceptable liberal arts concentrations are documented on page 176 of the RIT 2005-2006 Undergraduate Bulletin.

### **6. Science and Mathematics**

As part of a student's education, twenty-four credit hours of math and science courses are required. These courses include mathematics offerings in algebra and trigonometry, discrete mathematics, and analytic geometry. In addition, students are required to take two sections of physics and associated lab courses.



## **7. General Education Electives**

Students are required to take 18 credit hours of general education electives as part of their degree. General education electives must be selected from courses in Liberal Arts, Science, Math, or selected courses in other colleges. As part of the general education elective selection process, one course must be a communication elective. A communication elective is restricted to courses such as professional communication, technical writing, foreign language, public speaking, sign language, or another course related to interpersonal communication. Acceptable courses should always be confirmed with an academic advisor.

## **8. Free Electives**

Students must take twelve credit hours of free electives. The student may select from available courses within the institute, with the exception of bridge or service courses from GCCIS.

## **9. Physical Education**

All students at the bachelors level are required to take a total of three courses in physical education. A freshman student may use the first year experience courses to satisfy one of these requirements. Transfer students may choose to utilize the Wellness for Life course to satisfy the requirement. In addition, students must select two wellness activity courses to complete this experience. Details of physical education and wellness education requirements can be found on page 11 of the RIT Undergraduate Bulletin for 2005-2006.

## **10. Cooperative Education**

All students are required to complete three-quarters of cooperative education experience as part of this degree. Details regarding cooperative education requirements can be found in section II.E of this proposal.



GDD CORE		
QH	GD&D Common Core ( 60 QH )	
4	4002-320 Intro to Multimedia	
4	4003-231 Computer Science I (RAPT sect.)	
4	4003-232 Computer Science II (RAPT sect.)	
4	4003-233 Computer Science III (RAPT sect.)	
4	4002-330 Interactive Digital Media	
4	4050-210 SOHO Networking Essentials	
4	4002-360 Intro to Database & Data Modeling	
4	4002-425 HCI1: Human Factors	
4	4002-417 Visual C++ for Programmers	
4	4002-380 Fundamentals of Game Design and Development I	
4	4002-381 Fundamentals of Game Design and Development II	
4	4002-434 Programming for Digital Media	
4	4002-409 Website Design & Implementation	
4	4002-387 DS/Algos for Game Programmers I	
4	4002-487 DS/Algos for Game Programmers II	

COMPUTER ANIMATION CORE		
	GD&D Computer Animation Core ( 8 QH )	
4	2065-331 Introduction to Animation	
4	2065-361 Intro to 3D Computer Animation	

ADVANCED STUDIES		
	GD&D Advanced Studies ( 20 QH ) <b>Student Chooses 5 of the following 16</b> Pre-requisites apply amongst these courses (will replace pre-req to AI1/CG1 with core)	
4	4002-501 Foundations of 2D Graphics Progr.	
4	4002-502 Foundations of 3D Graphics Progr.	
4	4003-570 Computer Graphics 1	
4	4003-571 Computer Graphics 2	
4	4003-590 Procedural Shading	
4	4003-450 Programming Language Concepts	
4	4003-455 Artificial Intelligence	
4	4002-538 Multi-User Media Spaces	
4	4002-541 Data-Driven Time-Based Media Prg	
4	4003-572 Comp. Animation: Algos/Techniques	
4	4002-529 Introduction to VRML	
4	4003-552 AI for Interactive Environments	
4	4002-527 Digital Audio and Computer Music	
4	4002-528 Writing for Interactive Media	
4	4002-539 Programming for the WWW	
4	4002-484 Database Programming	

STUDENT SEMINARS		
	Seminars ( 3 QH )	
1	4002-201 Freshman Seminar (GD&D sect.)	
1	1105-051 FYE 1	
1	1105-052 FYE 2	

KEY		
	New Course	
	New Course Shared with Other Initiative	
	Existing Course	

B.S. in Game Design & Development @ R.I.T.	
	Total Credits: 181
	Years to Completion: 4 + 3 qtr. Co-op
	Co-Operative Ed: 3 quarters

LIBERAL ARTS		
	Liberal Arts ( 36 QH )	
4	0502-227 Writing	
4	0504/09/07/08/09 (Humanities)	
4	0504/09/07/08/09 (Humanities)	
4	0510/11/13/14/15 (Social Sciences)	
4	0510/11/13/14/15 (Social Sciences)	
4	05xx-3xx Arts of Expression	
4	Lib Arts Concentration	
4	Lib Arts Concentration	
4	Lib Arts Concentration	

SCIENCE & MATHEMATICS		
	Math & Science ( 24 QH )	
4	1016-204 Algebra and Trigonometry	
4	1016-205 Discrete Math for Tech I	
4	1016-206 Discrete Math for Tech II	
4	1016-228 Analytic Geometry	
4	1017-211 College Physics 1 – L271	
4	1017-212 College Physics 2 – L272	

GENERAL EDUCATION		
	General Education Electives ( 18 QH )	
	Communications Elective	

FREE ELECTIVES		
	Free Electives ( 12 QH )	

PHYSICAL EDUCATION		
	Physical Education Experiences	
0	Wellness (1105) or FYE	
0	Wellness Activity	
0	Wellness Activity	

COOPERATIVE EDUCATION		
	Cooperative Education (3 quarters)	
0	Cooperative Education Quarter	
0	Cooperative Education Quarter	
0	Cooperative Education Quarter	

Figure 2: Bachelors of Science in Game Design and Development Program Worksheet



## B. Required Courses

The following table lists all required courses in the program. The list is divided into two tables, courses required to satisfy institute requirements and courses required for the program. Courses noted with an asterisk (\*) are courses from colleges other than Liberal Arts, which are used to satisfy liberal arts requirements. Courses noted with a plus symbol (+) are courses that require students to be registered into a specific section.

### COURSES REQUIRED FOR INSTITUTE CORE

Course Number and Course Title	No. of Credits	Is this a new course?	Is this a revised course?
1105-051 First Year Experience 1	1	N	N
1105-052 First Year Experience 2	1	N	N
1016-204 Algebra and Trigonometry *	4	N	N
1016-205 Discrete Math for Information Technology I *	4	N	N
1016-206 Discrete Math for Information Technology II *	4	N	N
1016-228 Analytic Geometry	4	N	N
1017-211 College Physics I (Includes 1017-271 Lab) *	4	N	N
1017-212 College Physics II (Includes 1017-272 Lab) *	4	N	N
0502-227 Writing (Part of Liberal Arts Core)	4	N	N
0504/095/07/08/09 Liberal Arts Humanities (Part of Liberal Arts Core)	8	N	N
0510/11/13/14/15 Liberal Arts Social Sciences (Part of Liberal Arts Core)	8	N	N
05XX-3XX Arts of Expression (Part of Liberal Arts Core)	4	N	N
Liberal Arts Concentration (400-500 Level Courses)	4	N	N
Wellness Education / Physical Education Courses	0	N	N

Table 1: Institute core courses required of all students.



## REQUIRED PROGRAM COURSES

Course Number and Course Title	No. of Credits	Is this a new course?	Is this a revised course?
4002-320 Introduction to Multimedia	4	N	N
4003-231 Computer Science I (RAPT) * +	4	N	N
4003-232 Computer Science II (RAPT) * +	4	N	N
4003-233 Computer Science III (RAPT) * +	4	N	N
4002-330 Interactive Digital Media	4	N	N
4050-210 Small and Home Office Networking Essentials	4	N	N
4002-360 Introduction to Database and Data Modeling	4	N	N
4002-425 Human Computer Interaction I : Human Factors	4	N	N
4002-417 Visual C++ for Programmers	4	Y	N
4002-380 Fundamentals of Game Design and Development I	4	Y	N
4002-381 Fundamentals of Game Design and Development II	4	Y	N
4002-434 Programming for Digital Media	4	N	N
4002-409 Website Design and Implementation	4	N	N
4002-387 Data Structures and Algorithms for Game Programmers I	4	Y	N
4002-487 Data Structures and Algorithms for Game Programmers II	4	Y	N
2065-331 Introduction to Animation	4	N	N
2065-361 Introduction to 3D Computer Animation	4	N	N
4002-201 Freshman Seminar (GD&D) +	1	N	N

Table 2: Program courses for the Bachelors of Science in Game Design and Development.



## C. Program Electives

Students must select five courses for program electives. These electives comprise courses selectable for advance studies. Selection of courses is made with consultation with faculty and general advisement personnel.

### PROGRAM ELECTIVES (SELECT 5)

Course Number and Course Title	No. of Credits	Is this a new course?	Is this a revised course?
4002-501 Foundations of 2D Graphics Programming	4	N	N
4002-502 Foundations of 3D Graphics Programming	4	N	N
4003-570 Computer Graphics I	4	N	N
4003-572 Computer Graphics II	4	N	N
4003-590 Procedural Shading	4	N	N
4003-450 Programming Language Concepts	4	N	N
4003-455 Artificial Intelligence	4	N	N
4002-538 Multi-User Media Spaces	4	N	N
4002-541 Data-Driven Time-Based Multimedia Programming	4	Y	N
4003-572 Computer Animation: Algorithms and Techniques	4	N	N
4002-529 Introduction to VRML	4	N	N
4003-552 Artificial Intelligence for Interactive Environments	4	N	N
4002-527 Digital Audio and Computer Music	4	N	N
4002-528 Writing for Interactive Media	4	N	N
4002-484 Fundamentals of Database Client/Server Connectivity	4	N	N
4002-539 Programming for the WWW	4	N	N

Table 3: Program Electives for the Bachelors of Science in Game Design and Development. Students must select five courses with approval of faculty and general program advisement.



## D. Free Electives

Students must select an appropriate number of courses from both general electives and free electives. The number of credits for each category is described below. Representative courses depicting the types of choices students may make are listed below. See the RIT undergraduate course description website and RIT Undergraduate Bulletin 2005-2006 for further details.

### ELECTIVE CATEGORIES

Course Number and Course Title	No. of Credits	Is this a new course?	Is this a revised course?
General Education Electives *	18	N	N
Free Electives	12	N	N

Table 4: General and Free Elective categories.

### SAMPLE GENERAL EDUCATION ELECTIVES

Course Number and Course Title	No. of Credits	Is this a new course?	Is this a revised course?
0692-231 Contemporary Science: Biology *	4	N	N
0692-234 Oceanus *	4	N	N
1017-230 Stellar Astronomy *	4	N	N
0692-331 Sports Physiology / Fitness *	4	N	N
1031-201 Introduction to Environmental Science I *	4	N	N
1051-215 Imaging Science Fundamentals *	4	N	N
0535-200 Foundations of Communications *	4	N	N
0535-315 Quantitative Research Methods *	4	N	N
0501-201 Seminar in Criminal Justice*	4	N	N
0511-211 Principles of Microeconomics	4	N	N

Table 5: Sample Selection of General Education Electives.



## SAMPLE FREE ELECTIVES

Course Number and Course Title	No. of Credits	Is this a new course?	Is this a revised course?
0502-452 Creative Writing – Prose Fiction	4	N	N
0502-453 Advanced Creative Writing	4	N	N
0535-452 Uses and Effects of Mass Media	4	N	N
4050-341 Foundations of Data Communications	4	N	N
4002-426 Human Computer Interaction II: Interaction Design	4	N	N
4002-535 Network-Based Multimedia	4	N	N
4002-536 Web Client Side Programming	4	N	N
4002-485 Fundamentals of DBMS Architecture and Implementation	4	N	N
4050-402 OS Scripting	4	N	N
4002-415 Ethics in Information Technology	4	N	N

Table 6: Sample selection of free electives (can also include entries from Table 5).

### ***E. Cooperative Education (Co-op)***

Cooperative education, otherwise known as co-op, is a tradition and experience that makes an RIT education unique. As part of the academic process, co-op provides students with real-world job search and employment experiences. Students quickly learn how their classroom knowledge translates to practice and helps the student focus his or her educational path based upon experience from the field.

Students are required to participate in three quarters of cooperative educational experience. Students will be encouraged to select employers that reflect their particular interests within the game design and development field or related field. As with all cooperative educational experiences at RIT, selection of a cooperative education employer must be deemed appropriate by both the cooperative education office as well as program’s home department.



## F. Course Outlines

Included below are the RIT catalog descriptions for each of the courses that comprise the Bachelors of Science in Game Design and Development core as well as the advanced studies selections. In all cases, the minimum pre-requisite for enrollment is matriculation in the Bachelors of Science in Game Design and Development. Full course proposals for new and revised courses are included in Appendix E.

### 1. Game Design and Development Core

#### 4002-320 Introduction to Multimedia: The Internet and the Web

This class provides an introduction to key Internet, web, and multimedia technologies, as well as familiarity with the Macintosh computer platform. Topics covered include computer-mediated communication, basic Internet applications such as Telnet, FTP, and the WWW, basic digital image, audio, and video techniques, and web page development and publishing. **Prerequisites:** 4002-206 or computer literacy. **Credits:** 4.

#### 4003-231 Computer Science I (RAPT section)

The goal of this course is to introduce the student to the science of computing. The student will learn about the basic elements of computing, including problem decomposition, design and implementation of solutions, testing those solutions and integrating pieces of solutions together. Object-oriented technology is used as a means to an end to design solutions and actually implement them in software. Java is the language used; it is an object-oriented programming language that was designed for developing large systems from reusable components. Programming assignments—labs and post-labs are an integral part of the course. **Credits:** 4. **NOTE:** A special section of this course will be offered for Game Design and Development students.

#### 4003-232 Computer Science II (RAPT section)

This course continues the Java-based introduction to basic computer science concepts begun in Computer Science 1. Essentially, this course covers the use of object-oriented programming to design and implement software solutions. Students will learn how to implement a solution to a problem by reusing existing components and creating new components using inheritance. Other topics include; exception handling, files/streams, collections, threads and thread synchronization, graphical user interfaces (GUI's), networking, and event-driven programming. Programming projects—labs and projects are an integral part of the course. **Prerequisite:** 4003-231. **Credits:** 4. **NOTE:** A special section of this course will be offered for Game Design and Development students.



### **4003-233 Computer Science III (RAPT section)**

This course is the third course in the computer science introductory sequence and builds upon the computer science foundations and design principles presented in Computer Science 1 and Computer Science 2. Students will learn how to use linear data structures, such as stacks, queues, and lists and non-linear data structures, such as trees and graphs, and will also be introduced to the design and analysis of algorithms. Students will learn how to analyze the efficiency of basic sorting, searching, and hashing algorithms, and acquire an understanding of how recursion works. Object-oriented programming will be used to design solutions and implement them as Java programs. Programming assignments—labs and projects are an integral part of the course. **Prerequisite:** 4003-232. **Credits:** 4. **NOTE:** A special section of this course will be offered for Game Design and Development students.

### **4002-330 Interactive Digital Media**

This course introduces an event-driven scripting environment to enable the development of highly interactive user experiences. Students will learn to manage and edit a wide variety of digital media types—still and motion graphics, 3D, text, audio, and video, for example—and write code to allow users to access, control, and manipulate each of these media types. Students will gain foundation skills in media asset creation and in prototyping for applications and interface development. Programming will be required. **Prerequisites:** 4002-320 and either 4002-218, 4003-232, or equivalent introductory programming experience. **Credits:** 4.

### **4050-210 Small and Home Office Networking Essentials**

This course will teach students how to determine what computer and network equipment is appropriate for use in a home or small office network. Students will learn the basic configurations for a home/small office network and explore in a lab environment the different hardware and software tools and configurations required to establish a personal local area network. **Co-requisites:** 4050-210 Lab Section. **Credits:** 4.

### **4002-360 Introduction to Database and Data Modeling**

A presentation of the data modeling process and database implementation fundamentals. Data modeling, fundamental relational concepts, the process of normalization, relational algebra, SQL, and guidelines for mapping a data model into a relational database will be covered. Students will model a multimedia or text-only information problem and implement it with a commercially available database package. **Prerequisites:** 4002-218 or equivalent as well as 1016-206. **Credits:** 4.



## **4002-425 Human Computer Interaction I : Human Factors**

Human Computer Interaction (HCI) is a multidisciplinary field of study concerned with how humans interact with software and hardware interfaces. This course will focus on theories of human information processing, human behavior and their implications for user-centered design of interfaces. Topics include: HCI history, cognitive psychology, user analysis, task analysis, and requirements analysis in the usability engineering process. **Prerequisites:** Second-year standing. **Credits:** 4.

## **4002-417 Visual C++ for Programmers**

This course covers the basics of C++ development in the Windows environment. Topics covered include the use of an integrated development environment, basic C++ syntax, pointers, and Windows specific programming techniques. Emphasis is placed on the development of problem-solving skills. Large programming assignments are required. Prior programming experience is required. **Prerequisites:** 4002-219 or 4002-414 or 4003-233 or equivalent programming experience. **Credits:** 4.

## **4002-380 Fundamentals of Game Design and Development I**

Students will learn about the history of video games as well as the analysis of games as a medium. In addition, students will learn how to identify and assess the different types and genres of video games as well as how content shapes and is shaped by play in an interactive medium. Students will acquire the skills to create design documents and build playable prototypes. Some projects may require working in groups. **Prerequisites:** 4002-330 or 4002-231. **Credits:** 4.

## **4002-381 Fundamentals of Game Design and Development II**

Students build upon design documents and game assets created in the prerequisite course to create a complete design document and playable levels in a game prototype. Students will focus upon key concepts in game design and development such as game world design, level design, level balancing, and game character development. Students will also explore issues involving the development of online game community. Some projects may require working in groups. **Prerequisites:** 4002-380. **Credits:** 4.



## 4002-434 Programming for Digital Media

Scripting is a major tool for digital media development. In this course, students will write programs starting from simple navigational scripts and evolving toward interactive object-oriented solutions to problems from domains such as simulation, gaming, instruction and artificial life. Students will build data structures, lists and implement classes to navigate through screens, implement interfaces and control media. Some projects may require working in groups. The class or instructor may create low-level routines and classes which will be used by students to complete programs of their own design. **Prerequisites:** 4002-330 or 4002-231. **Credits:** 4.

## 4002-409 Web Site Design and Implementation

This course builds on the basic aspects of HTML and multimedia programming that are presented in 4002-320 and 4002-330. An overview of web design concepts, including usability, accessibility, information design, and graphic design in the context of the web will be covered. Introduction to web site technologies, including cascading Style sheets and DHTML will also be explored. **Prerequisites:** 4002-320, 4002-330 and two-course programming sequence. **Credits:** 4.

## 4002-387 Data Structures and Algorithms for Game Programmers I

This course focuses upon the application of data structures, algorithms, and fundamental Newtonian physics to the development of video game applications and entertainment software titles. Topics covered include trigonometric functions in game systems, 2D coordinate systems, 3D coordinate systems, geometric primitives, geometric tests, vectors, matrices, principles of transformation, and inclusion tests. In addition, traditional data structures and manipulation techniques will be applied to the context of game and entertainment software. Furthermore, Newtonian principles such as speed, acceleration, force, work, momentum, and motion will be examined in the context of developing game and entertainment software. Programming assignments are a required part of this course. **Prerequisites:** 4002-330, 1016-206, and 1017-211. Students will also be required to have 4003-233, 4002-219, or previous programming experience. **Credits:** 4.

## 4002-487 Data Structures and Algorithms for Game Programmers II

This course continues the investigation into the application of data structures, algorithms, and fundamental Newtonian physics required for the development of video game applications and entertainment software titles. Topics covered include techniques for 3D orientation, angular displacement, Euler angles, quaternion representations and operations, barycentric coordinates, classifiers, recursion, clipping, culling, and advanced partitioning techniques. In addition, advanced data structures such as trees and graphs will be investigated from the context of game application and entertainment software development. Furthermore, the course will examine advanced Newtonian principles used in games and simulations. Programming assignments are a requirement for this course. **Prerequisites:** 4002-387 and 4002-417. **Credits:** 4.



## **2065-331 Introduction to Animation I**

This class is a survey of basic techniques and aesthetics of animation. Provides training and practical experience in a wide variety of approaches to single-frame motion picture production. Students produce a number of short film exercises utilizing cut out, paint and draw, animation as well as kinestasis. Extensive film screenings illustrate each technique and related aesthetics. **Prerequisites:** 2065-263; JPHQ major or consent of instructor. **Credits:** 4.

## **2065-361 Introduction to 3D Computer Animation**

An introduction to three-dimensional computer animation. The basic principles of animation will be addressed within the context of producing three-dimensional computer animation. Students will produce a series of short 3D computer animations as part of the learning process and then a final short 3D computer animation of their own design. Students will become familiar with a variety of three-dimensional computer animation techniques and applications. **Prerequisites:** 2065-457. **Credits:** 4.

## **4002-201 Freshman Seminar**

An orientation seminar taken by first-year students in information technology. Topics covered include a curriculum overview, co-op and career alternatives in information technology, and orientation to RIT and college life. **Credits:** 4. **NOTE:** A special section of this course will be offered for Game Design and Development students.

## **2. Game Design and Development Advanced Studies**

### **4002-501 Foundations of 2D Graphics Programming**

Use of an advanced graphics API to access hardware accelerated graphics. Discussion of scene graphs, optimizations, and integration with the API object structure. Advanced use of the API calls in production code, to construct environments capable of real-time performance. **Prerequisites:** 4002-434 or 4003-570. **Credits:** 4.

### **4002-502 Foundations of 3D Graphics Programming**

Use of a graphics API to access hardware accelerated graphics. Discussion of the API scene graph, 3D optimizations, and integration between the 2D graphics mode and a 3D immediate mode implementation. This course builds upon students' previous work and extends it in the construction of a fully functional 3D engine, with library construction for game development. **Prerequisites:** 4002-501. **Credits:** 4.



## 4003-570 Computer Graphics I

A study of the hardware and software principles of computer graphics. Topics include an introduction to the basic concepts: 2-D transformations, viewing transformations, display file structure, geometric models, picture structure, interactive and noninteractive techniques, raster graphics fundamentals, 3-D fundamentals, graphics packages and graphics systems. Students will use and develop a graphics software system based on an accepted graphics standard. Programming projects are required. **Prerequisites:** Third-year standing in computer science. **Credits:** 4.

## 4003-571 Computer Graphics II

This course will investigate the theory of computer synthesis. Seminal computer graphics papers will be used to describe the various components of the image synthesis pipeline and explain, just as in photography, how the path of light in a virtual scene can be simulated and used to create photorealistic imagery. The course will emphasize the theory behind various rendering tools and libraries available for image synthesis. The student will put theory into practice via a programming assignments and a capstone project. Topics will include light and color, three-dimensional scene specification, camera models, surface materials and textures, rendering (local, ray tracing, radiosity), procedural shading and modeling, tone reproduction, and advanced rendering techniques. **Prerequisites:** 4003-570 or 4002-502. **Credits:** 4.

## 4003-590 Procedural Shading

A recent trend in Computer Graphics is the use of specialized procedural programming languages to define the textures and material properties of objects in a virtual scene. Programs written in these languages, called "shaders", greatly enhance the flexibility of rendering systems that previously relied on static, predefined lighting and shading models. Animated films, such as those created by Pixar, use shaders to give the film their characteristic look and their visual beauty. Shader support is now starting to become common on commodity graphics hardware, thus making these stunning effects possible in real time applications.

The goal of this course is to introduce students to the architectures and mechanisms of procedural shading and to teach them how to use shaders effectively in creating stunning visual effects. The course will compare and contrast real time vs. non-real time shader architectures and students will gain expertise in both environments. The format of the course delivery will be part lecture, part studio style with weekly programming assignments based upon the techniques presented in class. Cg will be used for real-time shader programming and RenderMan will be used for non-real time shader development. **Prerequisites:** 4003-571 or 4002-502. **Credits:** 4.



## **4003-450 Programming Language Concepts**

A study of the syntax and semantics of a diverse set of high-level programming languages. The languages chosen are compared and contrasted in order to demonstrate general principles of programming language design. This course emphasizes the concepts underpinning modern languages rather than the mastery of particular language details. Programming projects will be required. **Prerequisites:** 4003-334, 1016-265. **Credits:** 4.

## **4003-455 Artificial Intelligence**

An introduction to the field of artificial intelligence, including both theory and applications. A programming language that allows effective symbolic manipulation is used to demonstrate the capabilities and limitations of the material presented in class. Topics include search strategies and their implementation, logic, networks, frames and scripts, productions, symbolic manipulation and list processing, problem-solving methods, expert systems, natural language understanding, and selections from vision, robotics, planning and learning. Programming assignments are an integral part of the course. **Prerequisites:** 4003-450. **Credits:** 4.

## **4002-538 Multi User Media Spaces**

The course will focus on the development of interactive applications that use network connectivity to allow multiple users to interact with each other in real time and in a persistent virtual community. The course will integrate multiple technologies dealing with connectivity, database access, server-side logic and object-oriented programming environments. Important Human Computer Interaction (HCI) issues will be raised around design and processing of messages and the traffic patterns generated by multi-user messaging. **Prerequisites:** 4002-434 and third year standing. **Credits:** 4.

## **4002-541 Data-Driven Time-Based Multimedia Programming**

This course focuses upon the construction of time-based multimedia software that is data driven. Students will learn how to store and retrieve multimedia content such as text, image, audio, and video. In addition, students will learn how media content can be managed both locally and remotely through flat files and database systems. Students will also learn how to utilize various server technologies and communication protocols that are appropriate to the delivery of data to multimedia applications. Furthermore, students will also learn how to transform media types at various points along a data pathway in a variety of forms. Large-scale programming projects are required for this course. **Prerequisites:** 4002-330, 4002-360, and 4002-539. **Credits:** 4.



## 4003-572 Computer Animation: Algorithms and Techniques

This course takes a look at computer animation from a programmer's perspective. It will investigate the theory, algorithms and techniques for describing and programming motion for virtual 3D worlds. Approaches that will be explored include keyframing systems; kinematics, motion of articulated figures, procedural and behavioral systems, and the use of motion capture data. This course is a programming-oriented course with major deliverables including the implementation of techniques presented in lecture as well as a final project concentrating on an area of a student's choice. Students enrolling in this course are expected to have proficiency in the use of at least one 3D API (e.g. OpenGL, DirectX, Java3D). **Prerequisites:** 4003-570 or 4002-501 or permission of instructor. **Credits:** 4.

## 4002-529 Introduction to VRML

This course will focus on basic and advanced concepts of 3D environment creation and implementation within the Virtual Reality Markup Language (VRML) implemented on the World Wide Web. Students will work individually and in groups to create VRML environments on their own home pages and in a larger scale group environment. **Prerequisites:** 4002-409 and 4002-434. **Credits:** 4.

## 4002-552 Artificial Intelligence for Interactive Environments

This course delves into the use of artificial intelligence in interactive environments. These environments range from the entertaining nature of role-playing games to more serious military simulations. In all these environments, agents and groups of agents must interact in an intelligent manner. Topics will include advanced pathfinding algorithms, sensory systems, group tactical strategies, and learning algorithms. Projects are an inherent part of the course. **Prerequisites:** 4003-455 or permission of the instructor. **Credits:** 4.

## 4002-527 Digital Audio and Computer Music

Technologies and techniques for producing and manipulating digital audio and computer music are explored. Topics include digital representation of sound, synthesis techniques, digital audio recording and processing, MIDI and real-time performance issues, algorithmic composition, and application of digital audio to multimedia and Web production. **Prerequisites:** 4002-330 and 3rd year standing. **Credits:** 4.

## 4002-528 Writing for Interactive Media

As more of our communications are delivered on interactive, non-linear platforms, the information should be developed in ways that take advantage of these technologies. This course will focus on the creation of a variety of different hypermedia/multimedia documents designed, drafted and delivered in hard copy and/or digital form. **Prerequisites:** 4002-409. **Credits:** 4.



## **4002-484 Fundamentals of Database Client/Server Connectivity**

Students will configure, test, and establish client-server communication and server-server communication with single or multiple database servers. Students will configure and demonstrate successful communication between a database file server and multiple external clients. Similarities and differences among commercially available connectivity packages will be explored. Low-level data and file structures used in the implementation of databases and database indexing will be explored. Programming exercises are required. **Prerequisites:** 4002-360 and 4002-219 or 4002-318. **Credits:** 4.

## **4002-539 Programming for the WWW**

The World Wide Web is no longer just linked, static HTML documents. Web pages can be generated dynamically and can interact with a user to modify pages on-the-fly, validate user inputs and entertain. This course is an overview of several forms of programming that are used in the creation of interactive and dynamic web content. This course provides a practical overview of programming in the context of the World Wide Web. It enables students to develop web pages and web sites that incorporate both client-side and server-side programming by installing and modifying existing scripts as well as writing new scripts. **Prerequisites:** 4002-409. **Credits:** 4.



## G. Program Scheduling

Tables 7-10 depict the sequencing and scheduling of courses and credits in the program, by quarter, for the first full cycle of the program. Cooperative education block placement represents one possible alignment for the mandatory three quarters. It is the responsibility of the student to meet with an advisor to ensure that cooperative education block choices and course requirements can coexist within an appropriate schedule of completion.

### YEAR 1

FALL		WINTER		SPRING		SUMMER	
COURSE TITLE	CR.	COURSE TITLE	CR.	COURSE TITLE	CR.	COURSE TITLE	CR.
4003-231 Computer Science I	4.0	4003-232 Computer Science II	4.0	4003-233 Computer Science III	4.0		
4002-320 Intro to Multimedia	4.0	1016-205 Discrete Math for IT I	4.0	1016-206 Discrete Math for IT II	4.0		
1016-204 Algebra and Trigonometry	4.0	1017-211 College Physics I (w/1017-271)	4.0	1017-212 College Physics II (w/1017-272)	4.0		
Liberal Arts Core	4.0	0502-227 Writing	4.0	Liberal Arts Core	4.0		
1105-051 First Year Experience 1	1.0	1105-052 First Year Experience 2	1.0	Wellness Activity	0.0		
4002-201 Freshman Seminar	1.0						
<b>Total Credits</b>	18.0	<b>Total Credits</b>	17.0	<b>Total Credits</b>	16.0	<b>Total Credits</b>	0.0

Table 7: Example course sequencing for the first year of the program.



YEAR 2

FALL		WINTER		SPRING		SUMMER	
COURSE TITLE	CR.	COURSE TITLE	CR.	COURSE TITLE	CR.	COURSE TITLE	CR.
4002-330 Interactive Digital Media	4.0	4002-380 Fundamentals of Game Design and Development I	4.0	4002-381 Fundamentals of Game Design and Development II	4.0	Co-op	0.0
4002-360 Intro to Database and Data Modeling	4.0	4002-409 Web Site Design and Implementation	4.0	4002-387 Data Struct. and Algos. for Game Design and Development I	4.0		
2065-331 Intro to Animation I	4.0	2065-361 Intro to 3D Computer Animation	4.0	Liberal Arts Core	4.0		
Liberal Arts Core	4.0	1016-228 Analytic Geometry	4.0	4050-220 Small and Home Office Networking Essentials	4.0		
Wellness Activity	0.0				4.0		
<b>Total Credits</b>	16.0	<b>Total Credits</b>	16.0	<b>Total Credits</b>	16.0	<b>Total Credits</b>	0.0

Table 8: Example course sequencing for the second year of the program.

YEAR 3

FALL		WINTER		SPRING		SUMMER	
COURSE TITLE	CR.	COURSE TITLE	CR.	COURSE TITLE	CR.	COURSE TITLE	CR.
4002-417 Visual C++ for Programmers	4.0	Advanced Studies	4.0	Co-op	0.0	Co-op	0.0
4002-434 Programming for Digital Media	4.0	4002-487 Data Struct. and Algos. for Game Design and Development II	4.0				
4002-425 HCI1: Human Factors	4.0	Liberal Arts Concentration	4.0				
Arts of Expression Liberal Arts Core	4.0	General Education Elective	4.0				
<b>Total Credits</b>	16.0	<b>Total Credits</b>	16.0	<b>Total Credits</b>	0.0	<b>Total Credits</b>	0.0

Table 9: Example course sequencing for the third year of the program.



YEAR 4

FALL		WINTER		SPRING		SUMMER	
COURSE TITLE	CR.	COURSE TITLE	CR.	COURSE TITLE	CR.	COURSE TITLE	CR.
Advanced Studies	4.0	Advanced Studies	8.0	Advanced Studies	4.0		
Liberal Arts Concentration	4.0	General Education Elective	4.0	General Education Elective	4.0		
General Education Electives	6.0	Liberal Arts Concentration	4.0	Free Elective	8.0		
Free Elective	4.0						
<b>Total Credits</b>	18.0	<b>Total Credits</b>	16.0	<b>Total Credits</b>	16.0	<b>Total Credits</b>	0.0

Table 10: Example course sequencing for the fourth year of the program.

### H. Off-campus Courses

Besides cooperative education activities, none of the courses scheduled in this program meet at off-campus locations.

### I. Interdisciplinary Elements

The goal of the proposed degree program is to provide students with the expertise to embark on meaningful careers in the game, entertainment and related industries. This degree program will leverage the expertise of faculty members from the Information Technology and Computer Science Departments within the B. Thomas Golisano College of Computing and Information Sciences (GCCIS) and the Computer Graphics Design Program with the College of Imaging Arts and Sciences (CIAS). Students will benefit by interaction with faculty from each department. The degree program will also formalize interaction between participating faculty members from the three departments.

Of the courses listed in the program core and advanced studies, only two courses are specific to students enrolled in the Bachelors of Science in Game Design and Development. The two courses exclusive to this program are Fundamentals of Game Design and Development I and Fundamentals of Game Design and Development II. The remaining courses are of interest and use to their host departments. In many cases, program core and advanced core courses are shared over a multitude of degree and programs. The cooperative nature of this arrangement is indicative of shared curriculum supported by numerous departments and programs throughout GCCIS.

Initially, this program will share space with the Information Technology Department. Courses hosted by other departments and colleges will provide adequate space and resources as necessary. Documentation and details of such arrangements are outlined in Appendix A.



## ***J. Distance Learning***

This program will not be offered in a distance-learning format. However, the Institute does allow departments to offer distance-learning courses. In such cases, the Institute does provide students with traditional and distance choices such that degree requirements can be met. Thus, degree completion is not reliant upon any distance components.



## IV. Assessment

### A. Assessment Plan

#### 1. Program Goals and Educational Outcomes

The primary program goal of the Bachelors of Science in Game Design and Development is to produce successful professionals within the game design and development industry as well as in careers related to entertainment technology. The secondary program goal of this program is to produce professionals who understand the multidisciplinary nature of the gaming field. Both of these goals are equally important, as the first speaks to the technology-based educational goals of the Institute, and the second speaks to the social and communication skills needed to understand the games and entertainment technology industry.

The general goals of the program are implemented through a number of program objectives. The program objectives provide insight into what a student should be able to accomplish a few years after graduation when they are established in their career path. The program objectives for the Bachelors of Science in Game Design and Development are enumerated below. Upon completion of the program, students will be able to:

- A) Make effective oral presentations.
- B) Communicate effectively in written form.
- C) Identify needs, analyze tasks, and develop profiles relevant to users and stakeholders.
- D) Program effectively within the student's game design and development specialty area.
- E) Implement and query a relational database.
- F) Develop and evaluate effective user interaction designs for game and entertainment domains.
- G) Design and implement a website using appropriate media to meet the needs of the user.
- H) Design and develop a software prototype.
- I) Adhere to ethical standards related to the game design and development field.
- J) Develop specialized game design and development skills in a self-selected advanced study area.
- K) Participate effectively as a team member.
- L) Practice user-centered design, development, and deployment.
- M) Apply game-related algorithms and data structures towards the construction of entertainment and/or simulation software applications.
- N) Identify historical patterns in the game design and development field.
- O) Analyze methods of construction and use for game design patterns and components.
- P) Find gainful employment within the game design and development or related career field.



The program goals and program objectives will be addressed through a number of anticipated program outcomes. The program outcomes represent requirements for graduating students and are measurable as part of the assessment process. For each program outcome, several program objectives are listed.

- Use and apply current technical concepts and practices within the computing disciplines towards the field of game design and development. Maps to program objectives D, H, K, M, and O.
- Design effective and usable entertainment technologies and integrate them into appropriate software solutions. Maps to program objectives C, D, F, H, K, M, and O.
- Participate in the creation of an effective game design document that leads to the development of an entertainment software application or prototype. Maps to program objectives A, B, and H.
- Analyze, identify, and define the requirements that must be satisfied to address problems or opportunities encountered within the field of modern game design and development. Maps to program objective C, K, and L.
- Identify and evaluate current and emerging technologies that impact the field of game design and development. Maps to program objectives C, D, and N.
- Demonstrate best practices and development standards with respect to their application to game design and development solutions. Maps to program objectives D, I, N, and O.
- Demonstrate independent critical thinking and problem solving skills. Maps to program objectives E, D, G, H, J, M, N, and O.
- Incorporate currently accepted game industry processes towards the construction of a game design and development software application or prototype. Maps to program objectives C, D, H, J, M, and O.
- Participate effectively in multidisciplinary teams to create game and entertainment technology software solutions with respect to authoring, development, and maintenance roles reflected in the game design and development industry. Maps to program objectives A, B, C, D, F, I, J, K, M, and O.
- Participate effectively in multidisciplinary teams to create game and entertainment technology software solutions in which team achievement is a combination of personal achievement and group cooperation. Maps to program objectives B, I, and K.
- Participate in the construction of a large-scale game or entertainment technology application. Maps to program objectives C, D, H, J, and H.



- Communicate effectively with any number of game design and development stakeholders, including developers and end users. Maps to program objectives A, B, C, K, and P.
- Effectively promote ideas and communicate effectively using online media. Maps to program objectives C and G.
- Recognize the need for continued learning throughout their career. No program objectives directly relate to this outcome, however practices to demonstrate to students the methodology and practice of currency and adaptability are woven into many course offerings.

The program objectives and program outcomes effectively map onto RIT's Educational and Access goals. RIT's Educational and Access goals are divided into five categories: career education, liberal learning, excellence, community and personal growth, as well as access.

The goal of career education stipulated that students receive education that reflects emerging technologies and the global state of industry. Career education balances experiential and academic learning in an effective manner. The goal of career education is reflected through program objectives D, E, H, J, M, and O.

The goal of liberal learning ensures that students will acquire foundation skills required within the professional field. Liberal learning ensures students will have the proper communication, critical thinking, and quantitative reasoning skills to survive in the competitive market. Liberal learning also requires students to employ technology-based design and information discovery, processing, distribution, and presentation skills. The liberal learning foundation spans laboratory sciences, social sciences, fine arts, literature, philosophy, economics, and cultural studies. The goal of liberal learning is reflected in program objectives A, B, C, F, J, K, N, and O.

The goal of excellence requires students to pursue their studies within a framework of personal and professional excellence along with integrity and ethical standards. The goal of excellence is reflected in program objectives I and J.

The goal of community and personal growth requires students to develop a sense of global community and awareness of others, as well as an understanding of human diversity. In addition, the goal also encourages the discovery of personal strength and ability as well as the ability for increased interpersonal skills. This goal promotes a sense of career awareness as well as the desire to increase intellectual, social, and cultural experiences and interactions. The goal of community and personal growth is reflected through learning objectives C, F, K, N, O, P, and Q.

The goal of access ensures that students will be provided meaningful opportunities for learning and living by being afforded appropriate accommodations for their learning and living needs. Along with providing access, the goal also encourages students to recognize access potentials in their everyday interactions with their surroundings. The goal of access is supported through program objectives C, G, L, and O.



## 2. Assessment Methods

As the game design and development program spans multiple departments and colleges, assessment methods must be designed in a manner that promotes multidisciplinary understanding and allows for transparency in the intended goals and outcomes of courses as well as program procedures and policies. By performing regular and diligent assessment of the courses and the program, it is the intent that the evaluation process will help the faculty to maintain closer ties with students as well as each other and the industry as a whole.

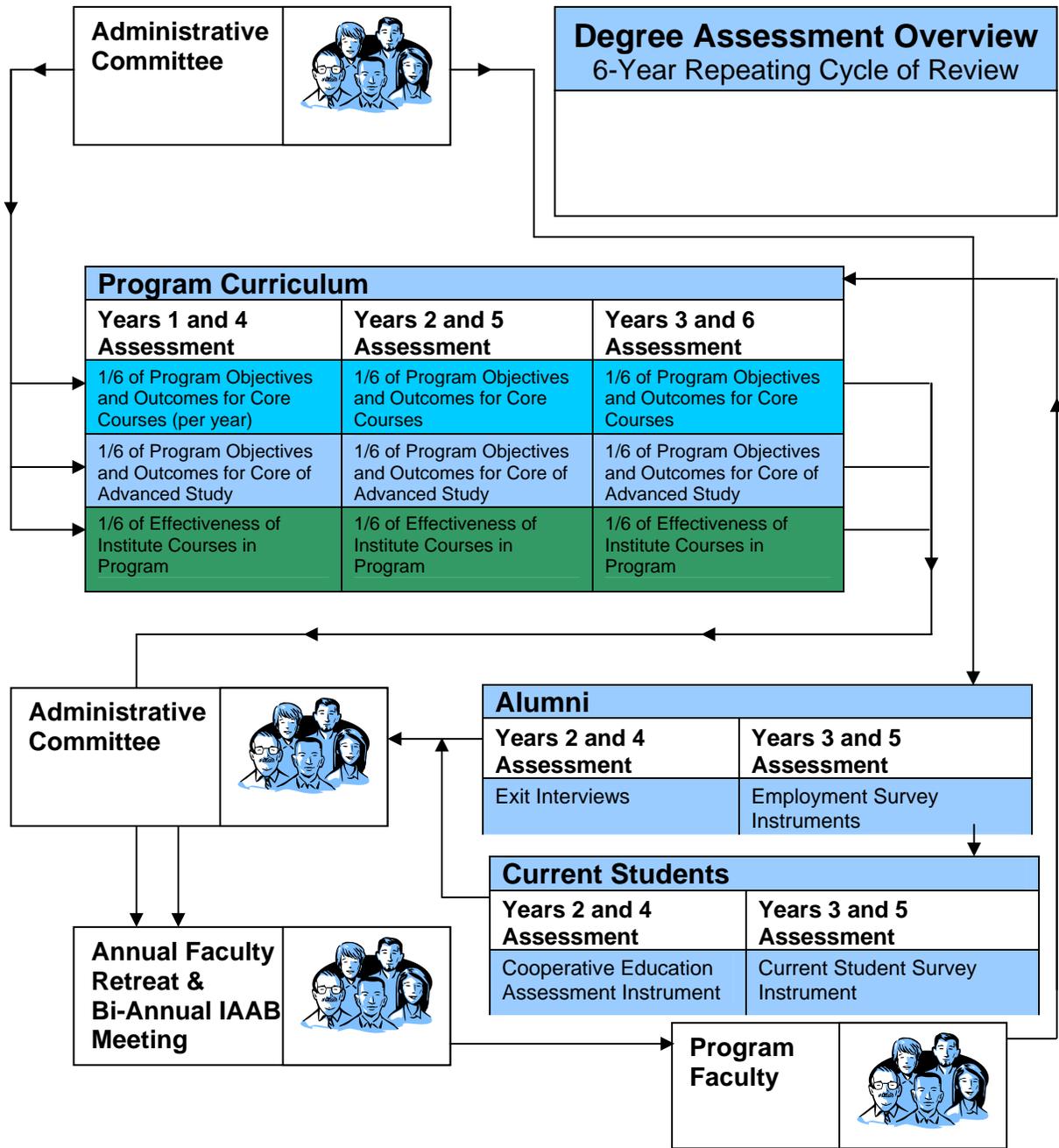


Figure 3: Assessment Cycle for the Game Design and Development Degree Program



The assessment process is initiated by the program's Administrative Committee. The Administrative Committee is charged with the direct oversight of Game Design and Development programs at RIT. Currently, the administrative committee consists of the authors of this document, including Director of Game Design and Development Andrew Phelps, M.S., Christopher Egert, Ph.D., Stephen Jacobs, M.A., Joseph Geigel, D.Sc., Jessica Bayliss, Ph.D., Nancy Doubleday, M.S., and Steven Kurtz, M.F.A. The Administrative Committee, or an officially appointed assessment subcommittee, will be charged with the selection of assessment targets for program evaluation each year. As the program will be housed within the Information Technology Department, the assessment process will utilize the existing departmental committee, including its practices. A member of the Administrative Committee will be appointed to act as liaison to the department's assessment committee. The Administrative Committee will be required to implement the departmental assessment committee's mandates and will be charged with the application and interpretation of the department's committee findings.

Program evaluation will occur over a six-year cycle, as depicted in Figure 3. The evaluation process is divided into two categories, program curriculum as well as student and alumni satisfaction. Each academic year, the Administrative Committee will select a specific set of courses for evaluation, selecting equally from the core courses, advanced studies, and general requirements.

From the selected courses, faculty will ascertain as to whether the course meets intended educational objectives and outcomes. A wide range of instruments will be used to measure the success of a course, and will include in-class, downstream, alumni, and industry inputs. All instruments will be designed twofold: the program's assessment committee will provide assessment requirements to the departmental assessment committee, which will incorporate those needs into the appropriate assessment instruments. By using this approach, it can be assured that assessment will incorporate the needs of the program while still maintaining consistency at the departmental level.

As the faculty revise and develop course related materials, a review panel of faculty from the program will review the materials internally. The process will be formative in nature and will help to insure the applicability and quality of materials related to the coursework. For course-level changes, curricular adjustment will follow the established process within the course's host department. Currently, this entails the Information Technology Undergraduate Curriculum committee and its counterparts within Computer Science and the College of Imaging Arts and Sciences. Program curricular changes will be considered by the program's Administrative Committee and will be ratified through the host department's appropriate curriculum committee, currently the Information Technology Department's Undergraduate Curriculum Committee.

To address assessment of the current student body and alumni of this program, survey instruments will measure their overall satisfaction with the degree and applicability of the program to their overall career goals. While students are matriculated in the program, focus groups will be conducted with the faculty to determine if the program is meeting the student's



educational expectations. In addition, evaluation of cooperative education experiences will help to ensure student preparedness as well as the quality of curricular materials. After graduation, alumni will be surveyed to determine if the program has successfully prepared them for their intended career path.

Another facet of assessment is the involvement of the Industrial and Academic Advisory Board (IAAB). Currently, each department's existing Industrial Advisory Board is comprised of select people who possess relevant backgrounds within the game industry and are directly involved with the game design and development process. These people have expressed an interest in advising this proposed degree program. Furthermore, Advisory Board members may also be selected directly from the game design and development industry. Members may also consist of academics from other universities or institutions with gaming or game related programs, degrees, or certificates. Finally, Advisory Board members may also consist of past graduates of the program who are working in industry or academia and who have a vested interest in the promotion and success of the degree program. In particular, the Advisory Board will provide insight and comment regarding particular content areas of the degree program, the overall direction of the degree, and how the degree matches the needs and future trends of the industry as a whole.

The results of curricular review, student focus groups, alumni survey instruments, and recommendations from individual IAAB members will be summarized and presented by the Administrative Committee to program faculty at an annual faculty retreat. The summary will also be presented to the Industrial and Academic Advisory Board at IAAB meeting, which will be conducted on a two-year cycle. After the results are presented, faculty will incorporate the feedback into curricular and program revisions.

Finally, the faculty will be responsible for disseminating classroom practice and results to juried- and peer-reviewed conferences and journals dealing with the academic aspects of game design and development as well as industrial practices. Potential avenues for publication include the ACM SIGGRAPH Educational Program, ACM SIGCSE, ACM SIGITE, ACM SIGCHI, and the Game Developer's Conference.

Appropriate and authorized personnel within each home department and the Institute may examine course materials and representative student work at any time upon request.

## ***B. Accreditation***

General accreditation of courses within the Game Design and Development program will occur as part of RIT's involvement with the Middle States accreditation process. At present, there is no professional organization or agency with the capability or authority to accredit a graduate game design and development program. Since the majority of courses in this proposal are contained within other degrees and certificate programs, they would be reviewed as part of required accreditation processes within each department or college. In the future, if a suitable professional accreditation organization or agency should come into existence, the faculty



members of the Game Design and Development program will endeavor to be associated with the creation, implementation, and deployment of accreditation standards.



## V. Faculty

The faculty participating in the Game Design and Development degree are affiliated with the Department of Information Technology and Department of Computer Science within the B. Thomas Golisano College of Computing and Information Science as well as various departments within the College of Imaging Arts and Sciences. A complete listing of all faculty, their affiliations, and new CV is provided in the full proposal.

### A. Description of Key Personnel

#### 1. Andrew Phelps

M.S. in Information Technology, Rochester Institute of Technology, 1999.

Professor Phelps is nationally recognized for his contributions in the areas of academic game and entertainment technology scholarship. He currently serves on the advisory board on the International Association for Game Education and Research. He has also served as a contributing editor for the International Game Developer's Association Special Interest Group on Online and Downloadable Games from 2002-2004. He has been elected and has served as a co-chair on the VRML consortium's External Authoring Interface committee, which created the standards document for VRML and External Programming Language interoperability (1999-2001). Professor Phelps has also been elected and as served on the V-Learn board of directors, a not-for-profit organization sponsored by Cornell University, University of Washington, Harvard, and other academic institutions (2000-2003). Professor Phelps has also been invited to participate in invited evaluation panels, workshops, and panels hosted by Macromedia, Inc. Professor Phelps has published numerous peer-reviewed and popular press articles on entertainment technology and has talked at numerous national and international conferences by invitation. Professor Phelps has also secured a principal investigators grant from Microsoft for his work on M.U.P.P.E.T.S. (Multi-User Programming Pedagogy for Enhancing Traditional Study). He has also served on a number of department, college, and institute-level committees for graduate curricula. He has also been an invited member of program review and assessment committees for other games programs at both the baccalaureate and masters level.

**Areas of Interest:** Entertainment Technology, Game Engine Design and Implementation, Graphics Techniques and Algorithms, and Virtual World Design and Implementation.

#### **Selected Publications:**

Phelps, A., Principal Investigators Grant from Microsoft Corporation for M.U.P.P.E.T.S. (Multi-User Programming Pedagogy for Enhancing Traditional Study), 2005.

Bierre, K., Ventura, P., Phelps, A., and Egert, C., "Motivating OOP by Blowing Things Up: An Exercise in Cooperation and Competition in an Introductory Java Programming Course", The Technical Symposium on Computer Science Education, Houston, TX, 2006.



Phelps, A., Egert, C. and Bierre, K., “MUPPETS: Multi-User Programming Pedagogy for Enhancing Traditional Study: An Environment for both Upper and Lower Division Students”, *Frontiers in Education*, Indianapolis, IN, 2005.

Phelps, A., Egert, C., Bierre, K., and Parks, D., “Half Day Workshop/Course: An Open-Source CVE for Programming Education: A Case Study”, *The 32nd International Conference on Computer Graphics and Interactive Techniques (SIGGRAPH)*, Los Angeles, CA, 2005.

Bierre, K. and Phelps, A., “The Use of MUPPETS in an Introductory Java Programming Course”, *Proceedings of the Special Interest Group in Information Technology Education*, Salt Lake City, UT, 2004.

Phelps, A., Bierre, K., and Parks, D., “MUPPETS: Multi-User Programming Pedagogy for Enhancing Traditional Study”, *Proceedings of the 4th Conference on Information Technology Education*, Lafayette, IN, 100-105.

## 2. Jessica Bayliss

Ph.D. in Computer Science, University of Rochester, 2001.

**Areas of Interest:** Artificial Intelligence, Alternative Computer Interfaces, and Agents in Computer Games.

### **Selected Publications:**

Bayliss, J., Microsoft Corporation Computer Game Production Curriculum Award for \$80,000 for a project entitled Reality and Programming Together (RAPT), 2004-2005.

Bayliss, J. and Inverso, S., “Automatic Error Correction Using P3 Response Verification for a Brain-Computer Interface”, *HCI International*, In Press, 2005.

Bayliss, J., Inverso, S., and Tentler, A., “Changing the P300 Brain Computer Interface”, *Cyberpsychology*, 7(6), 2004.

Bayliss, J., “The Use of the P3 Component of the Evoked Potential for Control in a Virtual Apartment”, *Brain-Computer Interfaces for Communication and Control 2nd International Meeting*, 2002.

## 3. Christopher Egert

Ph.D. in Computer Science and Engineering, University at Buffalo (SUNY), 2003.  
Minor in Media Study.



**Areas of Interest:** "Edutainment" Games and Online Play, Computer Mediated Communication, Computing Education through Multimedia Experiences, Distributed Systems, Desktop Virtual Reality, Agent Design, Application of Media Theory, and Computer-Human Interaction.

**Selected Publications:**

Bierre, K., Ventura, P., Phelps, A., and Egert, C., "Motivating OOP by Blowing Things Up: An Exercise in Cooperation and Competition in an Introductory Java Programming Course", The Technical Symposium on Computer Science Education, Houston, TX, 2006.

Phelps, A., Egert, C. and Bierre, K., "MUPPETS: Multi-User Programming Pedagogy for Enhancing Traditional Study: An Environment for both Upper and Lower Division Students", Frontiers in Education, Indianapolis, IN, 2005.

Decker, A., Haydanek, S., and Egert, C., "When Objects Collide: Abstractions over Common Physics Problems for Capstone Projects in CS1", Eastern Conference of the Consortium for Computing Sciences in Colleges, 2005.

Phelps, A. and Egert, C., "Educational Practices for Technology Students in Entertainment Domains", American Society for Engineering Education St. Lawrence Section Conference, Binghamton, NY, 2005.

Phelps, A., Egert, C., Bierre, K., and Parks, D., "Half Day Workshop/Course: An Open-Source CVE for Programming Education: A Case Study", The 32nd International Conference on Computer Graphics and Interactive Techniques (SIGGRAPH), Los Angeles, CA, 2005.

#### **4. Joseph Giegel**

D.Sc. in Computer Science, George Washington University, 2000.

**Areas of Interest:** Computer Graphics, Multimedia, and Virtual Theatre.

**Selected Publications:**

Geigel, J. and Schweppe, M., "Virtual Theatre: A Collaborative Curriculum for Artists and Technologists", The 32nd Annual Conference on Computer Graphics and Interactive Techniques (Educators Program), Los Angeles, CA, 2005.

Geigel, J. and Schaller, N., "Using Photography as a Metaphor for Teaching Image Synthesis", Computers and Graphics, 29(1), pp. 257-265, 2005.

Geigel, J. and Schweppe, M., "Theatrical Storytelling in a Virtual Space", Proceedings of the 1st ACM workshop on Story representation, Mechanism and Context, New York, NY, ACM Press, 39-46, 2004.

Geigel, J. and Loui, A., "Automatic Album Page Layout Using Genetic Algorithms for Electronic Albuming", Proceedings of Electronic Imaging, 2001.



## 5. Stephen Jacobs

M.A. in Media Studies, New School for Social Research, 1988.  
Graduate Coursework in Animation at RIT.

Professor Jacobs has been editor, contributing editor, or publisher for a number of popular press publications related to the games industry, including Gadget Boy Gazette, CNET Consumer Electronics' Future Tech Television 2.0, and Television Business International. Professor Jacobs has also engaged in freelance writing for popular publications such as Wired, and Fast Forward. He has served as a multimedia content designer and an "edutainment" game consultant for companies such as Anabasis Software, Discerning Nature, Binney and Smith, as well as Harbortown games from 1995-2003. Along with popular press publications, Professor Jacobs has also been the creator, producer, and director of a popular regional radio show, "What the Tech", which aired on public radio in Rochester from 2002-2005. Professor Jacobs success in the popular press has translated into numerous media placements (quotes and commentary in nationally recognized media outlets) and invited talks. Professor Jacobs has been a chapter contributor and chapter editor for two Charles River Media books. Professor Jacobs is also involved in the International Game Developer's Association Games Writers SIG, and has published nationally in this venue.

**Areas of Interest:** Social and Cultural Theories of Game Play and Interactivity, Media Theory Design Document Development, Narrative Structure Development for Games, History of Games and Entertainment Technology, and Human Factors.

### **Selected Publications:**

Jacobs, S., "The Basics of Narrative for Games", Game Writing: Narrative Skills for Video Games, Chapter Contributor, Charles River Media, Pending Publication.

Jacobs, S., "Writesizing", Game Developer, 2004.

Jacobs, S. "What The Tech!", Radio Show for Public Radio, 2002-2005.

Prof. Jacobs makes many appearances, provides press comments, and writes popular press articles for issues pertaining to the games industry as well as narrative and story for entertainment technologies.

## **B. Faculty Advising**

During the first quarter after admission, members of the Administrative Committee of the Game Design and Development program will advise newly admitted students. The Administrative Committee is charged with the direct oversight of Game Design and Development programs at RIT. Currently, the administrative committee consists of the authors of this document, including Director of Game Design and Development Andrew Phelps, M.S., Christopher Egert, Ph.D.,



Stephen Jacobs, M.A., Joseph Geigel, D.Sc., Jessica Bayliss, Ph.D., Nancy Doubleday, M.S., and Steven Kurtz, M.F.A.

The Administrative Committee matches students to program faculty based upon skill, ability, and interest. The program faculty advisor will be formally assigned to the student before the start of the second quarter. Faculty advisors will meet with students on a regular basis as well as at critical points in a student's academic career. The professional advisors in the Information Technology Department will also handle additional advising tasks.



## VI. Enrollment

### A. Admissions Requirements

Prospective students will be expected to have a high school diploma, or equivalent, and should be passionate in regards to the construction of game and entertainment technology software. Ideal students should have a strong background in areas such as mathematics, natural sciences, and physical sciences. Students should also demonstrate a breadth of high school courses that are synergetic with game design and development, including writing, communications, history, foreign languages, introductory programming and computing, as well as art.

Applicants to the program will apply through the Institute's Undergraduate Admissions Office. Applications will be gathered throughout the year, but will only be considered for Fall enrollment. Admission to the program will be based upon a number of factors, including high school performance, standard test scores, and letters of recommendation.

Incoming freshman will be considered if they meet the established criteria for this program, which is based upon the criteria for other programs within GCCIS. The program seeks students who are in the upper quarter percentile of their class in terms of high school GPA as well as class ranking. In addition, the program seeks students that score above or equal to 1200 on the Verbal and Math portions of the SAT exam and that score above or equal to 26 on each section of the ACT exam. Freshmen will be required to submit three letters of recommendation for entry into the program.

Transfer students should have a GPA greater than or equal to a 3.0 GPA ranked on a 4.0 scale. Transfer students are still required to submit letters of recommendation to be considered for the program. In the case where a transfer student's high school grades and testing scores are below the acceptable threshold, the student must show competency within pre-transfer coursework to be accepted into the program. Transfer students are bound by the Institute's rules governing transfer credit mapping. In most cases, a program faculty member will be required to perform articulation checks for transfer coursework to ensure that the program standards have been met.

For international students, the TOEFL test will be required to ensure necessary communication skills. For students taking the TOEFL, they must score above 230 on the computer-based examination, above 570 on the paper-based examination, or above 88 on the Internet-based examination.

The combination of high school math and sciences courses, a breadth of courses relevant to game design and development, and letters of recommendation will ensure that students are well prepared for entry into this program. The math and science courses will ensure that students have the correct level of analytical thought as well as critical thinking and problem solving skills to enter the program. The breadth courses will demonstrate that the student is able to appreciate more than just the technological, math, and science aspects of the discipline. A broader view of computing that embraces art, humanities, and communication is essential for success within the



field. Letters of recommendation help to ensure that the student is well rounded and has participated in activities within and outside of academic endeavors.

The program's Administrative Committee, or an appointed selection sub-committee, and Undergraduate Program Coordinators from the IT Department will work with the Undergraduate Admissions Office to select viable candidates. The goal is to accept approximately thirty incoming students and transfer students each academic year. By limiting the number of admitted students to thirty, the program can ensure a level of quality demanded by the professional field. All admissions materials will be due by February 1st prior to the subsequent school year fall quarter. Admissions decisions will be made by the early April for the subsequent school year.

The admissions process will also encourage participation from traditionally underrepresented student groups, including women and minorities. The multidisciplinary approach to the program ensures that students with a range of technical and social skills will be valued. A diverse student population also ensures that different perspectives into game design and development are properly represented, including cultural game systems as well as gender-friendly gaming experiences. Such participation will help to increase the global value of the degree and graduating students. We are currently working with corporations within the game and entertainment technology industry to encourage underrepresented groups, such as women and minorities, to apply to this program. At present, we are investigating corporate-sponsored scholarship programs as well as promotional events to encourage a broader participation pool. In addition, we are committed to outreach through groups that specifically target these populations such as the International Game Developer Association's Special Interest Group for Women in Gaming. Furthermore, several of our Industrial and Academic Advisory Board members are specifically interested in the area of gender and minority retention in computing and game development. The Administrative Committee for this program will leverage the Board's expertise in the area to ensure that the program can reach underrepresented groups. Faculty, as well as the Administrative Committee, will participate in RIT's institutional programs for attracting and retaining underrepresented students. Further, the program will advertise in venues specifically catered to underrepresented students and academic advisors.



## **B. Enrollment Information**

The following section presents information on competing programs, geographic draw, student enrollment status, enrollment projections, and attractors and retainers.

### **1. Competition**

An ever-growing number of community colleges, four-year colleges, and universities have recognized the importance of game design and development as an academic discipline. In addition, there have been a growing number of industry-sponsored schools promoting game curriculum. A listing of academic institutions by the industry-sponsored website Gamasutra (<http://www.gamasutra.com>) specifies over 400 institutions of various forms that provide industrial training, academic courses, certificate programs, or degrees in some aspect of game development and design or related entertainment technology discipline (Gamasutra, 2005).

It is important to note that despite the growing popularity of game curriculum, there are only a handful of top-rated universities and colleges that offer an undergraduate-level degree in game design and development as well as entertainment technology. The following paragraphs list programs that the authors of this document see as being regionally and nationally competitive, based upon institution mission and ranking.

Rensselaer Polytechnic Institute (RPI, 2005) provides a game study minor, co-sponsored by the department of cognitive science and the department of art. RPI is also planning an undergraduate major in Game and Simulation Arts and Sciences (RPI-GSAS, 2006), which is scheduled to start in the Fall of 2006 (D'Errico, 2005). This Bachelor's of Science degree will be initially offered as a dual-major program. As such, students must take a sequence of courses in game design and simulation systems along with a traditional major of computer science, psychology, or communications. This major is directed in part by Dr. James Watt, director of the Social and Behavioral Research Laboratory at RPI.

Worcester Polytechnic Institute (WPI, 2006) offers a four-year Bachelors of Science in Interactive Media and Game Development. The objective of WPI's program is to provide students with an understanding of both the artistic and the technical aspects of game design and development. Along with technologies for art and programming, students explore the philosophical, sociological, and cultural underpinnings of the game development field. The program also targets students for future careers in interactive media, art and design, or traditional computing disciplines such as computer science.

The University of Southern California (USC, 2006), has recently established its Bachelor of Science in Computer Science Games option. Supported, in part, through the the GamePipe Labs at USC, the degree promotes an interdisciplinary approach to game design and development. This degree and lab is, in part, guided by Dr. Michael Zyda, who has been a leader in the research area of virtual reality environments and interactive simulations for military domain



### ***C. Anticipated Graduation Rate***

It is anticipated that the graduation rate of this program will be comparable to existing GCCIS Bachelor's programs in Computer Science, Information Technology, and Software Engineering.

### ***D. Graduation Marketability***

Appendix B contains letters of support from potential employers of graduates from this program. Companies such as Microsoft, Sony, Electronic Arts, Linden Labs and Vicarious Visions employ undergraduates and graduate students who have taken gaming courses within the Information Technology Department's college-wide concentration in Game Programming. Using this as an indicator, we believe that graduates of this program would be highly valued due to their technical competence and broad set of experiences in team-based multidisciplinary development.



## **Appendix A: RIT Internal Letters of Support**

Appendix A has been omitted here for brevity, but is on file in the full proposal at the Academic Senate Office.



# Appendix B: External Letters of Support



## 1. Dr. Mary Flanagan – Hunter College / Tiltfactor Research Lab



# HUNTER

The City University of New York

Department of Film & Media Studies  
School of Arts and Sciences  
Phone: 646.642.6408  
Fax: 212.772.5138

October 30, 2006

Institute Curriculum Committee  
Rochester Institute of Technology  
B. Thomas Golisano College of Computing & Information Science  
102 Lomb Memorial Drive  
Rochester New York 14623

Dear Members of the Curriculum Committee:

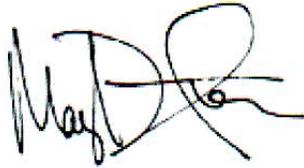
I am excited to have the opportunity to review the plans for the new RIT undergraduate degree program in Game Design and Development. I am a scholar in both the humanistic and scientific sides of computer game development, and teach courses in game design in New York City. I believe from my own experience teaching game design, and witness the rise of the field overall, new programs are considered necessary to handle the emergence of game-related educational opportunities.

Certainly the program proposed is not only a great compliment to existing faculty research areas, but will satisfy student demand in a burgeoning area of study. The plan presented is well thought through, and the research undertaken for the planning of the program is well documented, timely, and apt. The program planners have assessed need for the program and have thoughtfully formed an innovative yet realistic approach to a games curriculum at the undergraduate level.

The Game Design and Development degree program proposed for RIT offers an ideal balance of resonant educational experiences and team-based development environments, which students in this field require to succeed (in both industry positions, and in order to pursue future research opportunities). This program could likely become the leading program in the region with its solid curriculum plan.

Sincerely,

Yours,



Dr. Mary Flanagan  
Associate Professor  
Film and Media Studies Hunter College  
Director, Tiltfactor Research Laboratory <http://www.tiltfactor.org>  
[mary@maryflanagan.com](mailto:mary@maryflanagan.com) <http://www.maryflanagan.com>



## 2. Jason Della Rocca – International Game Developers Association





870 Market Street, Suite 1181  
San Francisco, California 94102  
T: +1-415-738-2104 F: +1-415-7382178

November 1, 2006

Professors Jacobs, Phelps and Egert  
B. Thomas Golisano College of Computing and Information Sciences  
102 Lomb Memorial Drive  
Rochester, NY 14623

Gentlemen,

It's my pleasure to write a letter of support for your Undergraduate Program in Game Design and Development. The industry is growing at a phenomenal rate around the world and there's a need for talent that's had the benefit of a full undergraduate degree. Game Design and Development is an interdisciplinary field. Successful members of the industry draw on a wide range of skills and need to work with team members with a wide range of educational backgrounds and skill sets. The program you've designed provides your students a strong range of courses and an opportunity for interdisciplinary experience.

As the Executive Director of the International Game Developers Association, I work with game developers, large and small from all over the world; experienced professionals, free-lancers getting their first contract and high school and college students looking to break into the industry. This program will provide the industry with new graduates that have the strong base they need to be assets to the professional community and I look forward to hearing from the students and graduates of this program in the years to come.

Sincerely,

Jason Della Rocca

Executive Director  
International Game Developers Association  
jason@igda.org

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[www.igda.org](http://www.igda.org)



Game Design & Development  
Entertainment Technology Lab  
B. Thomas Golisano College of Computing & Information Sciences  
Rochester Institute of Technology  
games.rit.edu

### 3. Richard Dansky – Red Storm Entertainment



10/31/06

Institute Curriculum Committee  
Rochester Institute of Technology  
B. Thomas Golisano College of Computing and Information Science  
102 Lomb Memorial Drive  
Rochester, NY 14623

Dear Members of the Committee:

One of the biggest challenges facing the video game industry is finding qualified personnel to help imagine, design and develop new games. As the field expands, so does the demand for individuals with a deep and wide knowledge base as what goes into making a game. I was pleased to write a letter of support previously for the Graduate Degree and extend that support now to the proposed undergraduate degree program as well.

Video game development is still a very young field. As developers and publishers, we're still learning what it takes to make games - what experience is appropriate, what skills are needed and how someone can prepare themselves to work in the field. In interviews with game developers, the same question always comes up - What did you study? The answers come back all over the map: literature, hard sciences, psychology, you name it. What you don't find, even with emerging undergraduate programs in game development, is someone saying "I learned how to make good games." And you definitely don't hear, " I learned how to make good games better."

That said, we're also learning from those first undergraduate game degree programs that a pure focus on technology (for the programmers) or art and animation (for the content creator) is appropriate either. The strongest candidates have a blend of education in their preferred specialty mixed with a good liberal arts background, some coursework in a games related skill set ( art for programmers, programming for artists) and, most important, the opportunity for hands-on experience in teams for development.

In the videogame field, we learn by doing. Experience trumps all. If you want to learn, you do it on the job by tackling the real assignment, the next go-round, the next production cycle. An undergraduate program that emphasizes assignments that mimic this in the classroom, combined with a COOP education program that requires on-the-job experience as a graduation requirement, can really prepare students to enter this demanding, multi-disciplinary industry.

I look forward to seeing the work of graduates from this program.

Sincerely,

Richard Dansky  
Manager of Design  
Red Storm Entertainment

(A PHELPS NOTE: This letter provided in email, hard copy on letterhead is en route)



**4. Beth A. Dillon - Game Career Guide / IGDA Games Education SIG  
Communications Director**



Beth Aileen Dillon  
GameCareerGuide.com Editor  
[editors@gamecareerguide.com](mailto:editors@gamecareerguide.com)



10/20/06

Institute Curriculum Committee  
Rochester Institute of Technology  
B. Thomas Golisano College of Computing and Information Science  
102 Lomb Memorial Drive  
Rochester, NY 14623

Dear Members of the Committee:

As Editor for Gamasutra's *Game Career Guide* (extended from the education section of game industry's leading online resource) and Communications Director of the IGDA Game Education SIG, I have a depth of insight into varied offerings in game education globally. Recently there has been not only extensive growth in the game industry, but in post-secondary education programs in game development as well.

However, many of the education programs that have emerged in the past few years have cannot deliver what they promise in terms of game education. Recently I was part of a panel on the "How to Break In" at the recent FuturePlay 2006 conference in London, Ontario where I commented on this academic shortfall. After the presentation, a group of 8 students approached me to discuss their own program and said that they were afraid that it did not have the sufficient depth, rigor, or faculty to deliver on the educational program advertised. All I could do was advise them to work within the program they were in or look elsewhere.

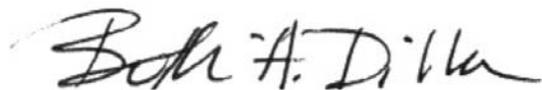
So although there are numerous programs out there, strong programs whose faculty are respected and whose students are successful in the industry are still limited in number. RIT's graduate courses have delivered a strong educational program that has put the college on the short list of industry resource professionals from companies such as Electronic Arts, Sony, and Microsoft. The program delivers a blend of educational experience and hands-on experience in teams for development. I feel confident that their proposed undergraduate degree will continue in the footsteps of their graduate program and offer students a rich educational experience that will allow their undergraduate



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degree students the same record of success in the workplace and respect in the field that their graduate students have already established.

Sincerely,

A handwritten signature in black ink that reads "Beth A. Dillon". The signature is fluid and cursive, with the first letters of each name being capitalized and prominent.

Beth A. Dillon  
Editor, CMP's Game Career Guide  
Communications Director, IGDA Game Education SIG



## **Appendix C: Faculty C.V.'s**

Faculty C.V.'s are provided in appendix C in the full proposal, but are omitted here for brevity.



## **Appendix E: Full Course Proposals for New and Revised Courses**

Full course proposals are omitted here for brevity, but are provided in the full proposal.



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