RIT

Rochester Institute of Technology

Game Design and Development BS - Curriculum

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Game Design and Development, BS degree, typical course sequence

Course		Sem. Cr. Hrs.
First Year		
IGME-105	**General Education – Elective: Game Development and Algorithmic Problem Solving I**	4

This course introduces students within the domain of game design and development to the fundamentals of computing through problem solving, abstraction, and algorithmic design. Students will learn the basic elements of game software development, including problem decomposition, the design and implementation of game applications, and the testing/debugging of their designs. (This course is restricted to GAMEDES-BS Major students.) Lec/Lab 6 (Fall, Spring).

IGME-106	**General Education – Elective: Game Development and Algorithmic Problem Solving II**	4

This course furthers the exploration of problem solving, abstraction, and algorithmic design. Students apply the object-oriented paradigm of software development, with emphasis upon fundamental concepts of encapsulation, inheritance, and polymorphism. In addition, object structures and class relationships comprise a key portion of the analytical process including the exploration of problem structure and refactoring. Intermediate concepts in software design including GUIs, threads, events, networking, and advanced APIs are also explored. Students are also introduced to data structures, algorithms, exception handling and design patterns that are relevant to the construction of game systems. (Prerequisites: C- or better in IGME-105 or equivalent course and student standing in the GAMEDES-BS program.) Lec/Lab 6 (Fall, Spring).

IGME-110	**General Education – Elective: Introduction to Interactive Media**	3

This course provides an overview of media in historical, current and future contexts. Incorporating lectures and discussion with hands on work involving written and interactive media assets, students examine the role of written and visual media from theoretical as well as practical perspectives. The course also provides an introduction to interactive media development techniques, including digital media components and delivery environments. Students will be required to write formal analysis and critique papers along with digital modes of writing including collaborative editing and effective presentation design. (This course is restricted to 1st - 3rd year students in NWMEDID-BS and GAMEDES-BS.) Lab 3, Lecture 3 (Fall, Spring).

IGME-119	**2D Animation and Asset Production**	3

This course provides a theoretical framework covering the principles of animation and its use in game design to affect user experience. Emphasis will be placed upon principles that support character development and animations that show cause and effect. Students will apply these principles to create animations that reflect movement and character appropriate for different uses and environments. (This course is restricted to students in GAMEDES-BS or NWMEDID-BS or GAMED-MN students.) Lec/Lab 3 (Fall, Spring).

MATH-131	**General Education – Mathematical Perspective A: Discrete Mathematics**	4

This course is an introduction to the topics of discrete mathematics, including number systems, sets and logic, relations, combinatorial methods, graph theory, regular sets, vectors, and matrices. (Prerequisites: MATH-101, MATH-111, NMTH-260, NMTH-272 or NMTH-275 or a Math Placement Exam score of at least 35.) Lecture 4 (Fall, Spring).

MATH-185	**General Education – Mathematical Perspective B: Mathematics of Graphical Simulation I**	3

This is the first part of a two course sequence that aims at providing the mathematical tools needed to manipulate graphical objects and to model and simulate the physical properties of these objects. Topics from linear algebra, primarily in two and three dimensional space, analytic geometry, and calculus will be presented. The emphasis is on linear algebra, particularly its application to problems in geometry and graphical systems. (Prerequisites: MATH-101 or MATH-111 or MATH-131 or NMTH-260 or NMTH-272 or NMTH-275 or equivalent course.) Lecture 3 (Spring).

PHYS-111	**General Education – Natural Science Inquiry Perspective: College Physics I**	4

This is an introductory course in algebra-based physics focusing on mechanics and waves. Topics include kinematics, planar motion, Newton's laws, gravitation; rotational kinematics and dynamics; work and energy; momentum and impulse; conservation laws; simple harmonic motion; waves; data presentation/analysis and error propagation. The course is taught using both traditional lectures and a workshop format that integrates material traditionally found in separate lecture, recitation, and laboratory settings. Lab 4, Lecture 2 (Fall, Spring, Summer).

YOPS-010	**RIT 365: RIT Connections**	0

RIT 365 students participate in experiential learning opportunities designed to launch them into their career at RIT, support them in making multiple and varied connections across the university, and immerse them in processes of competency development. Students will plan for and reflect on their first-year experiences, receive feedback, and develop a personal plan for future action in order to develop foundational self-awareness and recognize broad-based professional competencies. Lecture 1 (Fall, Spring).

	General Education – First Year Writing (WI)	3
	General Education – Social Perspective	3
	General Education – Global Perspective	3

Second Year

IGME-099	**Co-op Preparation Workshop**	0

This course helps students prepare for co-operative education employment ("co-op") by developing job search strategies and material. Students will explore current and emerging aspects of IGM fields to help focus their skill development strategies. Students are introduced to RIT's Office of Career Services and Cooperative Education, and learn about professional and ethical responsibilities for their co-op and subsequent professional experiences. Students will work collaboratively to build résumés and digital portfolios, and to prepare for interview situations. (This course is restricted to NWMEDID-BS or GAMEDES-BS or COMPEX-UND students with at least second year standing.) Lecture 1 (Fall, Spring).

IGME-202	**Interactive Media Development**	3

In this course, students will learn to create visually rich interactive experiences. It is a course in programming graphics and media, but it is also a course on the relationship between ideas and code. Students will explore topics in math and physics by building programs that simulate and visualize processes in the natural world. Assignments will include major programming projects, such as building a virtual world inhabited by digital creatures that display observable behaviors. (Prerequisites: (C- or better in IGME-106 or IGME-116 or IGME-206 or IGME-201) and MATH-185 or equivalent courses and GAMEDES-BS or NWMEDID-BS Major or GAMEDD-MN students.) Lec/Lab 3 (Fall, Spring).

IGME-209	**Data Structures & Algorithms for Games & Simulations I**	3

This course focuses upon the application of data structures, algorithms, and fundamental Newtonian physics to the development of video game applications, entertainment software titles, and simulations. Topics covered include 3D coordinate systems and the implementation of affine transformations, geometric primitives, and efficient data structures and algorithms for real-time collision detection. Furthermore, Newtonian mechanics principles will be examined in the context of developing game and entertainment software where they will be applied to compute the position, velocity and acceleration of a point-mass subject to forces and the conservation of momentum and energy. Programming assignments are a required part of this course. (Prerequisites: (C- or better in IGME-116 or IGME-106 or IGME-206 or IGME-201 or equivalent course and GAMEDES-BS or NWMEDID-BS students) or (C- or better in CSCI-140 or CSCI-142 or CSCI-242 or ISTE-121 or equivalent course and GAMEDD-MN students).) Lab 3 (Fall, Spring).

IGME-219	**3D Animation and Asset Production**	3

This course provides an overview of 3D game asset production. Basic ideas learned within the first asset production course are also revisited within the 3D environs. Topics covered include modeling, texturing, skinning and animation. Emphasis is put on low polygon modeling techniques, best practices in game art production, and effective communication strategies between artists, programmers and designers. (Prerequisites: IGME-119 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Fall, Spring).

IGME-220	**Game Design & Development I**	3

This course examines the core process of game design, from ideation and structured brainstorming in an entertainment technology context through the examination of industry standard processes and techniques for documenting and managing the design process. This course specifically examines techniques for assessing and quantifying the validity of a given design, for managing innovation and creativity in a game development-specific context, and for world and character design. Specific emphasis is placed on both the examination and deconstruction of historical successes and failures, along with presentation of ethical and cultural issues related to the design and development of interactive software and the role of individuals in a team-oriented design methodology. Students in this class are expected to actively participate and engage in the culture of design and critique as it relates to the field. (This course is restricted to students in GAMEDES-BS or NWMEDID-BS or GAMED-MN or GAMEDD-MN YR 2-5 students.) Lec/Lab 3 (Fall, Spring).

IGME-235	**Introduction to Web Technology for Game Developers**	3

This course introduces web technologies commonly used in the production and distribution of both content focused web sites, and in the creation of interactive applications and games. Students will create web sites and web-native interactive experiences, and publish them to the web. Programming projects are required. (Students must be in GAMEDES-BS or NWMEDID-BS and have completed (IGME-102, IGME-106, IGME-116 or IGME-206) and IGME-110. Students cannot take and receive credit for this course if they have taken IGME-230.) Lecture 3 (Fall, Spring).

IGME-236	**Interaction, Immersion, & the Media Interface (WI-PR)**	3

This course examines the concepts of interface and interaction models in a media-specific context, with particular emphasis on the concept of the immersive interface. This course explores concepts such as perception, expectation, Gestalt Theory, interactivity, Semiotics, presence, and immersion in the context of media application development and deployment. In addition, underlying concepts of cognitive psychology and cognitive science will be integrated where appropriate. These theories are then integrated in the exploration of the immersive interface, and with related concepts such as user-level-interface modification, augmentation of identity, and the interface as a social catalyst. (Prerequisites: (IGME-102 or IGME-106 or IGME-206) and IGME-110 or equivalent courses and in GAMEDES-BS or NWMEDID-BS programs.) Lec/Lab 3 (Fall, Spring).

IGME-499	**Undergraduate Co-op (summer)**	0

Cooperative education is a work experience designed to supplement the educational process. Students may select from a range of activities designated as cooperative education, including relevant industrial experience, internships, entrepreneurial activities, as well as faculty-supervised research and innovation opportunities. (Prerequisite: IGME-99 or equivalent course.) CO OP (Fall, Spring, Summer).

Choose one of the following:	3

MATH-171	**Calculus A**	

This is the first course in a three-course sequence (COS-MATH-171, -172, -173). This course includes a study of functions, continuity, and differentiability. The study of functions includes the exponential, logarithmic, and trigonometric functions. Limits of functions are used to study continuity and differentiability. The study of the derivative includes the definition, basic rules, and implicit differentiation. Applications of the derivative include optimization and related-rates problems. (Prerequisite: C- or better in MATH-111 or C- or better in ((NMTH-260 or NMTH-272 or NMTH-275) and NMTH-220) or a math placement exam score greater than or equal to 50.) Lecture 5 (Fall, Spring).

MATH-181	**Project-Based Calculus I**	

This is the first in a two-course sequence intended for students majoring in mathematics, science, or engineering. It emphasizes the understanding of concepts, and using them to solve physical problems. The course covers functions, limits, continuity, the derivative, rules of differentiation, applications of the derivative, Riemann sums, definite integrals, and indefinite integrals. (Prerequisite: A- or better in MATH-111 or A- or better in ((NMTH-260 or NMTH-272 or NMTH-275) and NMTH-220) or a math placement exam score greater than or equal to 70 or department permission to enroll in this class.) Lecture 6 (Fall, Spring, Summer).

MATH-181A	Calculus I	
MATH-186	**Mathematics of Graphical Simulation II**	

This is the second part of a two-course sequence that aims at providing the mathematical tools needed to manipulate graphical objects and to model and simulate the physical properties of these objects. Topics from linear algebra, primarily in two and three dimensional space, analytic geometry, and calculus will be presented. The emphasis is on analytic geometry and calculus, as applied to geometric and physical simulations. (Prerequisites: MATH-185 or equivalent course.) Lecture 3 (Fall).

	General Education – Ethical Perspective	3
	General Education – Scientific Principles Perspective	3
	General Education – Artistic Perspective	3

Third Year

IGME-309	**Data Structures & Algorithms for Games & Simulations II**	3

This course continues the investigation into the application of data structures, algorithms, and fundamental Newtonian mechanics required for the development of video game applications, simulations, and entertainment software titles. Topics covered include quaternion representation of orientation and displacement, cubic curves and surfaces, classifiers, recursive generation of geometric structures, texture mapping, and the implementation of algorithms within game physics engines for collision detection and collision resolution of rigid bodies, and the numerical integration of the equations of motion. In addition, advanced data structures such as B+ trees and graphs will be investigated from the context of game application and entertainment software development. Programming assignments are a requirement for this course. (Prerequisites: IGME-209 and (MATH-171 or MATH-181 or MATH-181A) and (MATH-185 or MATH-241) and (PHYS-111 or PHYS-211 or (PHYS-206 and PHYS-208)) or equivalent courses and student standing in GAMEDES-BS or NWMEDID-BS or GAMEDD-MN.) Lec/Lab 3 (Fall, Spring).

IGME-320	**Game Design & Development II**	3

This course continues to examine the core theories of game design as they relate to the professional field. Beginning with a formalized pitch process, this course examines the design and development paradigm from story-boarding and pre-visualization through rapid iteration, refinement, and structured prototyping exercises to further examine the validity of a given design. Specific emphasis is placed on iterative prototyping models, and on methodologies for both informal and formal critique. This course also explores production techniques and life-cycle in the professional industry. (Prerequisites: (IGME-202 and IGME-220 or equivalent courses and GAMEDES-BS or NWMEDID-BS or GAMEDD-MN students) or (IGME-102 and IGME-220 or equivalent courses and GAMED-MN students).) Lec/Lab 3 (Fall, Spring).

Choose one of the following:		3
IGME-330	**Rich Media Web Application Development I**	

This course provides students the opportunity to explore the design and development of media-rich web applications that utilize both static and procedurally manipulated media such as text, images and audio. This course examines client and server-side web development and features common to such applications. Issues explored include framework characteristics, information management, presentation, interactivity, persistence, and data binding. Programming projects are required. (Prerequisites: IGME-230 or IGME-235 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Fall, Spring).

IGME-330H	Honors Rich Media Web Application Development I	
IGME-499	**Undergraduate Co-op (summer)**	0

Cooperative education is a work experience designed to supplement the educational process. Students may select from a range of activities designated as cooperative education, including relevant industrial experience, internships, entrepreneurial activities, as well as faculty-supervised research and innovation opportunities. (Prerequisite: IGME-99 or equivalent course.) CO OP (Fall, Spring, Summer).

	General Education – Immersion 1, 2	6
	General Education – Electives	6
	Advanced Elective	3
	Open Electives	6

Fourth Year

	Advanced Electives	9
	Open Electives	9
	General Education – Immersion 3	3
	General Education – Electives	9
Total Semester Credit Hours		124

Please see General Education Curriculum (GE) for more information.

(WI) Refers to a writing intensive course within the major.

* Please see Wellness Education Requirement for more information. Students completing bachelor's degrees are required to complete two different Wellness courses.

‡ Students will satisfy this requirement by taking either a 3 or 4 credit hour lab science course. If a science course consists of separate lecture and laboratory sections, students must take both the lecture and the lab portions to fulfill the requirement.

Advanced Electives

IGME-340 **Multi-platform Media App Development**

Interactive media applications are no longer restricted to personal computers. They can now be found on many distinct hardware platforms including mobile, tablet, wearable, and large-screened computing devices. In this course, students will learn to design, prototype and develop media rich interactive experiences that can be deployed to a wide variety of hardware devices. Programming projects are required. (Prerequisites: IGME-330 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lecture 3 (Fall, Spring).

IGME-350 **International Game Industry**

This course will immerse students in the international games industry via a study-abroad experience in a location that will vary. The course will hold several meetings on campus before departure, but then the bulk of the course will center on a two-plus-week intensive experience abroad. While abroad, RIT students will spend half the course on the campus of a host university where they will participate in classes and/or other academic offerings, participate in a weekend game jam at the host university, and visit local and regional sites with cultural, historical, and/or game industry significance. Students will spend the rest of the course in a major city center of game development visiting game studios, governmental offices related to the games industry, and/or cultural and historical sites. This course has been offered for both Germany (the largest European games market) and Japan. Other offerings in other countries may emerge over time and the country visited varies for year to year. International travel is required. (Prerequisites: IGME-320 or IGME-330 or equivalent course.) Lecture 3 (Spring).

IGME-386 **Spatial Algorithms and Problem Solving**

This course is targeted to students with a serious interest in geographical problem solving via underlying spatial algorithms. Students will learn how to compare and contrast different specific spatial algorithms for solving specific geographic problems and develop proficiency with encoding and implementing spatial algorithms in computer programs. Students taking this course will gain a broad interdisciplinary skill set in how to think spatially and computationally through critical engagement of geographical problem solving. (This class is restricted to undergraduate students with at least 2nd year standing.) Lecture 3 (Fall).

IGME-420 **Level Design**

This course introduces level design theory and best practice through game level analysis, evaluation, and creation. Students will learn by analyzing game levels from existing games and discussing what made those levels successful or unsuccessful. Through their analysis and hands on experience, students will gain an understanding of overall level design including layout, flow, pacing, and balance. They will enhance their understanding of level design principles by creating their own game levels. (Prerequisites: IGME-219 and IGME-220 or equivalent courses and student standing in NWMEDID-BS or GAMEDES-BS.) Lec/Lab 3 (Fall, Spring).

IGME-421 **Tabletop Game Design and Development**

This course explores issues pertaining to design, mechanics, development, and production of analog, tabletop hobby games, which include board games, card games, wargames, and other non-digital games catering to multiple players. Students will analyze and apply concepts and mechanics of modern tabletop game design, and build and test tabletop games. Students will work with development and prototyping tools, explore component design and art direction, and work with desktop publishing technologies. In addition, they will work directly with board game publishing and manufacturing technologies and services, and study factors pertaining to the business of tabletop games. (Prerequisites: IGME-220 or equivalent course.) Lec/Lab 3 (Fall, Spring).

IGME-422 **Level Design 2**

This course expands upon the level design concepts presented in IGME-420, further exploring advanced level design topics and applying them to additional game genres. The course delves deeper into level design processes and methodologies as they relate to more complex game types using a project-based format. Throughout the course, various game genres will be studied and explored, with projects including game analysis and the creation of custom levels. (Prerequisites: IGME-420 or equivalent course.) Lab 3 (Fall, Spring).

IGME-423 **Games for Change**

This course provides students with the opportunity to explore games and simulations for social change and learning. Students will explore various research, design, and development techniques for applying games to addressing issues and problems in communities, from local to global. Students will learn to design and develop games and simulations as well as how to gather and analyze data about the games' usage. Topics may include issues-based organizing and advocacy, place-based learning, and games for civics. In addition, students are exposed to current debates in the field of Games for Change. (Prerequisites: IGME-220 or equivalent course and GAMEDES-BS or NWMEDID-BS Major students.) Lecture 3 (Fall, Spring).

IGME-430 **Rich Media Web Application Development II**

This course provides students the opportunity to continue the exploration of Media Rich Internet Applications (MRIAs). Topics include communications for media ecologies, distributed web application frameworks, advanced interactivity, data transformation, representation, automation, persistence, and large scale systems deployment. In addition, students are exposed to concepts and technologies related to the next generation of MRIA development. (Prerequisites: IGME-330 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Fall, Spring).

IGME-440 **Online Virtual Worlds & Simulations**

Students will create online virtual worlds and simulations using 3D development technologies. Critical to the exploration of this area, students will learn to utilize 3D constructs for the presentation of and interaction with interactive content and dynamic experiences. The course allows students to integrate prior knowledge in design, programming, and interaction for the creation of such experiences. Individual and group projects will be required. (Prerequisites: IGME-202 and (MATH-171 or MATH-181 or MATH-181A or MATH-186) or equivalent courses.) Lec/Lab 3 (Fall, Spring).

IGME-450 **Casual Game Development**

This course explores the design and construction of casual game experiences. Topics include modes of casual game play, mechanics for casual games, characteristics of successful games, development processes, and the distribution of casual games. Students will create casual games, and employ technologies to address issues of scalability, presentation, social interconnectivity, and game analytics. (Prerequisites: IGME-330 or equivalent course and restricted to students in NWMEDID-BS or IGME-320 or equivalent course and restricted to students in GAMEDES-BS.) Lec/Lab 3 (Spring).

IGME-451 **Systems Concepts for Games and Media**

This course focuses on systems-based theoretical models of computation in the context of a media-delivery modality. Students will explore concepts such as memory management, parallel processing, platform limitations, storage, scheduling, system I/O, and optimization from a media-centric perspective. Particular emphasis will be placed on the integration of these concepts in relation to industry standard hardware including game consoles, mobile devices, custom input hardware, etc. (Prerequisites: IGME-309 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Spring).

IGME-460 **Data Visualization**

Our world is flooded with data, and making sense of it can be a challenge. Visualizations help by exposing information, trends, and correlations that might otherwise go unnoticed in the raw data. In this course, students will learn to collect, clean, organize, and filter data sets of their own choosing. They will learn and apply principles from multiple fields including visual design, the psychology of perception, user experience design, and ethics. They will create static and interactive visualizations with a variety of information structures (hierarchies, maps, timelines, etc.). Students will learn to develop exploratory experiences that tell the story within the data. Programming projects are required. (Prerequisites: IGME-330 or equivalent course.) Lec/Lab 3 (Spring).

IGME-470 **Physical Computing & Alternative Interfaces**

The rich variety and widespread adoption of gestural touch screens, motion-sensing devices, weight-reactive surfaces, wearable digital devices, and similar interface products demonstrates the demand for well-integrated devices and services that seamlessly couple people and environments. Such products can interface computers with real-world inputs and outputs, and give people new ways of controlling and experiencing their devices and information. This course provides a rapid technical introduction to basic electronics (components, circuits, microcontrollers, etc.) and emphasizes the application of interface design concepts to physically interactive and innovative product development. The course requires solo and team projects that blend electronics, programming, and design. (Prerequisites: IGME-102 or IGME-106 or IGME-206 or equivalent course and at least 3rd year standing.) Lec/Lab 3 (Fall).

IGME-480 **Current Topics in Interactive Development**

Interactive media development is a rapidly evolving field. This course provides an opportunity for students to learn and experiment with emerging themes, practices, and technologies that are not addressed elsewhere in the curriculum. Topics covered in this course will vary based on current developments in the field. Students will explore, design, and develop creative interactive experiences pertaining to the semester's domain area. Programming projects are required. (Prerequisites: IGME-330 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Spring).

IGME-529 **Foundations of Interactive Narrative**

This course focuses on the major elements of narrative for interactive environments. Students in this course explore the basics of narrative in the context of interactive games and media, with examination of digital storytelling in games and interactive environments of several varieties. Branching narrative, hypertext, multi- and non-linear concepts are also explored with an emphasis on balancing immersive and interactive aspects of digital narrative. (NWMEDID-BS,GAMEDES-BS) Lec/Lab 3 (Spring).

IGME-531 **Aesthetics and Computation**

Students will design and build creative applications, while studying the history of computation in the visual arts, music, and other relevant areas. Technical topics include advanced audiovisual programming techniques, while theoretical topics include foundational discussions on artificial life, generative art, microsound, participatory and process-based art, programming as performance, and computational creativity. Individual and/or group projects will be required. (Prerequisites: IGME-330 or equivalent course.) Lec/Lab 3 (Fall, Spring).

IGME-540 **Foundations of Game Graphics Programming**

Students will explore the use of an advanced graphics API to access hardware-accelerated graphics in a real-time graphics engine context. The course will involve discussion of scene graphs, optimizations, and integration with the API object structure, as well as input schemes, content pipelines, and 2D and 3D rendering techniques. Students will also explore the advanced use of the API calls in production code to construct environments capable of real-time performance. Students will construct from scratch a fully functional graphics engine, with library construction for game development. (Prerequisites: IGME-309 or equivalent course and student standing in GAMEDES-BS.) Lec/Lab 3 (Fall).

IGME-550 **Foundations of Game Engine Design and Development**

This course will provide students with theory and practical skills in game engine design topic areas such as understanding the graphics pipeline as it influences engine design, hardware principles and the relationship to game engine construction, mathematical principles involved in game engine design, scene graph construction and maintenance, texture and materials management, collision systems, physics systems, particle systems, and control systems. Furthermore, this course will examine software and toolsets that assist game engine designers in their tasks. Students will be expected to design and implement a game engine in teams as well as properly document their design and development strategy. (Prerequisites: IGME-540 or equivalent course and student standing in GAMEDES-BS.) Lec/Lab 3 (Spring).

IGME-560 **Artificial Intelligence for Game Environments**

This course explores introductory artificial intelligence concepts through both a theoretical and practical perspective, with an emphasis on how to apply these concepts in a game development context. In particular the course focuses on applying concepts such as search, reactive intelligence, knowledge representation, and machine learning to real-time situations and applications as relevant to the field of entertainment technology and simulation. (Prerequisites: IGME-309 or equivalent course and student standing in GAMEDES-BS.) Lec/Lab 3 (Spring).

IGME-570 **Digital Audio Production**

Technologies and techniques for producing and manipulating digital audio are explored. Topics include digital representations of sound, digital audio recording and production, MIDI, synthesis techniques, real-time performance issues, and the application of digital audio to multimedia and Web production. (Prerequisites: IGME-202 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Fall).

IGME-571 **Interactive Game and Audio**

This course provides students with exposure to the design, creation and production of audio in interactive applications and computer games. Students will become familiar with the use of sound libraries, recording sounds in the studio and in the field, generating sound with synthesizers, and effects processing. Students will create sound designs for interactive media, integrating music, dialog, ambient sound, sound effects and interface sounds within interactive programs. (Prerequisites: IGME-202 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Spring).

IGME-580 **IGM Production Studio**

This course will allow students to work as domain specialists on teams completing one or more large projects over the course of the semester. The projects will be relevant to experiences of the interactive games and media programs, but will require expertise in a variety of sub-domains, including web design and development, social computing, computer game development, multi-user media, human-computer interaction and streaming media. Students will learn to apply concepts of project management and scheduling, production roles and responsibilities, and their domain skill sets to multidisciplinary projects. Students will complete design documents, progress reports and final assessments of themselves and their teammates in addition to completing their assigned responsibilities on the main projects. (Prerequisites: IGME-330 or equivalent course and restricted to students in NWMEDID-BS or IGME-320 or equivalent course and restricted to students in GAMEDES-BS.) Lec/Lab 3 (Fall, Spring, Summer).

IGME-581 **Innovation & Invention**

In this course, students explore the process and products of innovation and invention. Each semester a multi-disciplinary team of students conceives and develops a different outside the box project. Readings, projects, scholarly term papers, and pragmatic challenges of collaboration and communication across disciplines provides direct experience of the interplay of technology, human nature, and a human environment in which emerging technologies and new modes of interaction are pervasive and ubiquitous. Artists, natural scientists, social scientists, and technologists are guided through a series of collaborative experiences inventing, designing, implementing and studying emerging technologies. Presentations, projects and individually-written research papers are required. The faculty staff and resources of the Center for Student Innovation are significant assets for this course. (This class is restricted to undergraduate students with at least 3rd year standing.) Lec/Lab 3 (Fall, Spring).

IGME-582 **Humanitarian Free & Open Source Software Development**

This course provides students with exposure to the design, creation and production of Open Source Software projects. Students will be introduced to the historic intersections of technology and intellectual property rights and will become familiar with Open Source development processes, tools and practices. They will become contributing members of humanitarian software, game and interactive media development communities. Students will actively document their efforts on Humanitarian Free and Open Source Software community hubs. (Prerequisites: This class is restricted to students with at least 2nd year standing.) Lec/Lab 3 (Spring).

IGME-583 **Legal and Business Aspects of FOSS**

The entertainment and software industries are grappling with the impacts of free software digital distribution. Agile development, 3D printing, the Internet and other technologies are changing the face of how business is done, as well as what business can charge for and hold onto. Disruptive technologies, emerging interfaces, and real-time, on-demand product creation and distribution are transforming our entertainment, telecommunications and manufacturing landscapes. This course will examine the impacts of these new technologies and the new thinking that are taking us into these new worlds. (Prerequisites: IGME-582 or equivalent course.) Lec/Lab 3 (Fall).

IGME-584 **Software Development on Linux Systems**

Students will learn how to package software for release and engage in version maintenance within the FOSS community. Topics such as Linux package management, version control systems, potential license conflicts, development vs. production releases, bug tracking, maintenance management, forking, patching and future development will be covered in from both a management and end-user perspective in lectures, lab exercises and a project. (Prerequisites: IGME-582 or equivalent course.) Lec/Lab 3 (Spring).

IGME-585 **Project in FOSS Development**

Free and Open Source Software development is an internationally growing methodology for distributing work across multiple developers. The process can be applied to small garage-sized teams (small utility packages, multimedia plugins, simple games) or teams of hundreds (Mozilla, Java, Linux). This course builds on the introductory experience provided in the prerequisite to provide hands-on open-source development experience in a large-scale, project that will be prepared for open-source distribution. The actual projects and domains addressed will vary offering to offering, but will be along the lines of those listed above. (Prerequisites: IGME-582 or equivalent course.) Lec/Lab 3 (Spring).

IGME-588 **New Media Interactive Development Capstone II**

This course is designed to engage the New Media major in a capstone production experience. The instructor will form interdisciplinary student teams that will design, plan, prototype, and implement new media projects. Student groups are required to test their product with users and provide written feedback and analysis. Students will be evaluated on individual contributions and their team's final capstone project. (Prerequisites: NMDE-401 or equivalent course and student standing in NWMEDID-BS program.) Lab 3, Lecture 2 (Spring).

IGME-589 **Research Studio**

This course will allow students to work as domain specialists on teams completing one or more faculty research projects over the course of the semester. The faculty member teaching the class will provide the research topic(s). Students will learn about research methodology to implement, test, and evaluate results of projects. Students will complete research reports and final assessments of themselves and their teammates in addition to completing their assigned responsibilities on the main projects. (This course is restricted to students in NWMEDID-BS or GAMEDES-BS with 3rd year standing.) Lec/Lab 3 (Fall, Spring, Summer).

IGME-590 **Undergraduate Seminar in IGM**

This is intended to allow for special one-time offerings of undergraduate topics or to allow faculty to pilot new undergraduate offerings. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given special-topics offering. (This course is restricted to students in NWMEDID-BS or GAMEDES-BS with 3rd year standing.) Lec/Lab 3 (Fall, Spring, Summer).

IGME-599 **Independent Study**

The student will work independently under the supervision of a faculty advisor on a topic not covered in other courses. (Enrollment in this course requires permission from the department offering the course.) Ind Study (Fall, Spring, Summer).

IGME-601 **Game Development Processes**

This course examines the individual and group roles of the development process model within the game design and development industry. Students will transform design document specifications into software and hardware needs for developers, testers, and end users. Students will examine team dynamics and processes for technical development, content development, testing, deployment, and maintenance. Students will explore the design process through the deconstruction of the game industry's software lifecycle model. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall).

IGME-602 **Game Design**

This course presents students with core theories of game design, informed by research results from media theory, narrative methods and models, theories of ideation, and the nature of games, play and fun. Specific emphasis is placed on the examination of historical successes and failures, along with presentation of ethical and cultural issues related to the design of interactive software. Students will engage in formal critique and analysis of media designs and their formal elements. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall).

IGME-603 **Gameplay and Prototyping**

This course explores the pragmatic issues of creative concept development through story-boarding, pitching, prototyping and play-testing. Students will use various tools and techniques to build game prototypes that they will evaluate through play-testing in an incremental design process informed by market research and analysis. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall).

IGME-621 **Board and Card Game Design and Development**

This course explores issues pertaining to design, mechanics, development, and production of analog, tabletop “hobby” games, which include board games, card games, wargames, and other non-digital games catering to multiple players. Students will analyze and apply concepts and mechanics of modern tabletop game design, and build and test both competitive and cooperative tabletop games, designed specifically for a global audience. Students will work with development and prototyping tools, explore component design and art direction, and work with desktop publishing technologies. In addition, they will work directly with board game publishing and manufacturing technologies and services, and study factors pertaining to the business of tabletop games, and produce a professional, polished tabletop game. (Prerequisites: (IGME-602 and student is matriculated in GAMEDES-MS); or (IGME-220 and student is matriculated in GAMEDES-BS/NWMEDID-BS)) Lecture 3 (Spring).

IGME-622 **Game Balance**

This course is an in-depth exploration of the sub-field of game design known as balance. Topics include: transitive mechanics and cost/power curves; economic systems in games; probability and the psychology of randomness; pseudorandom numbers; situational balance; level/XP curves, advancement and pacing; tuning; statistics, metrics, and analytics; intransitive mechanics, game theory, and payoff matrices; and the applied use of spreadsheets. (This course is restricted to students in the GAMEDES-MS program.) Lecture 3 (Fall).

IGME-623 **Theory and Design of Role Play and Interactive Narrative**

Role playing games (RPGs) are among the most popular game forms. RPG design incorporates elements from most game genre. This course will address all aspects of design relevant to role play, both digital and analog, and the course will focus on the underlying theory of role play as a practice. We will talk about popular games, but will also spend time on experimental and innovative role play. Students should expect to study playing styles, RPG structure, and to both study and produce effective interactive narrative. Lab 3 (Spring).

IGME-624 **Tabletop Role-Playing Game Design and Development**

This course explores the concepts and mechanics of analog role-playing games, such as tabletop "pencil-and-paper" and live-action role-playing games, from a practical, hands-on perspective. In this project-based course, students will develop their own rule systems to facilitate various facets of role-playing and associated game mechanics, then playtest and publish their games. Students will also use desktop publishing tools to produce game rules and supplemental materials suitable for publication. Note that this course assumes that students have extensive experience in playing tabletop role-playing games. (Prerequisites: (IGME-602 and student is matriculated in GAMEDES-MS); or (IGME-220 and student is matriculated in GAMEDES-BS/NWMEDID-BS)) Lecture 3 (Fall, Spring).

IGME-670 **Digital Audio Production**

Technologies and techniques for producing and manipulating digital audio are explored. Topics include digital representations of sound, digital audio recording and production, MIDI, synthesis techniques, real-time performance issues, and the application of digital audio to multimedia and Web production. (Students must be in GAMEDES-MS or GAMEDES-BS and have taken IGME-202. Undergraduate students may not take and receive credit for this course if they have already taken IGME-570.) Lec/Lab 3 (Fall).

IGME-671 **Interactive Game and Audio**

This course provides students with exposure to the design, creation and production of audio in interactive applications and computer games. Students will become familiar with the use of sound libraries, recording sounds in the studio and in the field, generating sound with synthesizers, and effects processing. Students will create sound designs for interactive media, integrating music, dialog, ambient sound, sound effects and interface sounds within interactive programs. (Students must be in GAMEDES-MS or GAMEDES-BS and have taken IGME-202. Undergraduate students may not take and receive credit for this course if they have already taken IGME-571.not if IGME-571) Lec/Lab 3 (Spring).

IGME-680 **IGM Production Studio**

This course will allow students to work as domain specialists on teams completing one or more large projects over the course of the semester. The projects will be relevant to experiences of the interactive games and media programs, but they will require expertise in a variety of sub-domains, including web design and development, social computing, computer game development, multi-user media, human-computer interaction and streaming media. Students will learn to apply concepts of project management and scheduling, production roles and responsibilities, and their domain skill sets to multidisciplinary projects. Students will complete design documents, progress reports and final assessments of themselves and their teammates in addition to completing their assigned responsibilities on the main projects. (Prerequisites: IGME-601 or equivalent courses.) Lec/Lab 3 (Fall, Spring).

IGME-681 **Innovation and Invention**

In this course, students explore the process and products of innovation and invention. Each semester we conceive and develop a different outside the box project in a multidisciplinary tinkerer's lab. Readings, lectures, student presentations, and discussions deal with the interplay of technology, human nature, and a human environment in which emerging technologies and new modes of interaction are pervasive and ubiquitous. Students from multiple disciplines are guided through a series of collaborative experiences inventing, designing, implementing and studying emerging technologies and their educational and artistic potential. Presentations, projects and individual research papers are required. (This course requires permission of the Instructor to enroll.) Lec/Lab 3 (Fall, Spring).

IGME-690 **IGM Seminar**

This is intended to allow for special one-time offerings of graduate topics. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given seminar offering. (Varies) (This course is restricted to GAMEDES-MS students or (GAMEDES-BS or NWMEDID-BS students with at least 3rd year standing).) Lecture (Fall, Spring, Summer).

ISTE-230 **Introduction to Database and Data Modeling**

A presentation of the fundamental concepts and theories used in organizing and structuring data. Coverage includes the data modeling process, basic relational model, normalization theory, relational algebra, and mapping a data model into a database schema. Structured Query Language is used to illustrate the translation of a data model to physical data organization. Modeling and programming assignments will be required. Note: students should have one course in object-oriented programming. (Prerequisites: ISTE-120 or ISTE-200 or IGME-101 or IGME-105 or CSCI-140 or CSCI-142 or NACA-161 or NMAD-180 or BIOL-135 or GCIS-124 or equivalent course.) Lec/Lab 3 (Fall, Spring).

ISTE-454 **Mobile Application Development I**

This course extends the material covered in the Foundations of Mobile Design course and provides students with the experience of creating interesting applications for small-size form factor mobile devices such as smartphones These devices are exceptionally portable, have unique sets of hardware and communications capabilities, incorporate novel interfaces, are location aware, and provide persistent connectivity. Students are encouraged to make creative use of these unique device characteristics and operating properties to develop innovative applications. Programming projects are required. (Prerequisites: (ISTE-252 and ISTE-340) or IGME-330 or equivalent courses.) Lec/Lab 3 (Fall, Spring).

ISTE-456 **Mobile Application Development II**

This course extends the Foundations of Mobile Design course in that students will learn to apply mobile design skills to develop applications in the Android platform. Students will design, develop, and test mobile applications using the Android Studio IDE. This course covers the major components such as activities, receivers, content providers, permissions, intents, fragments, data storage, and security. Programming projects are required (Prerequisites: (ISTE-252 and ISTE-340) or IGME-330 or equivalent courses.) Lec/Lab 3 (Fall, Spring).

Accelerated Dual-Degree Programs

Today's careers require advanced degrees grounded in real-world experience. RIT's Combined Accelerated Pathways enable you to earn both a bachelor's and a master's degree in as little as five years of study. You'll earn two degrees while gaining the valuable, hands-on experience that comes from co-ops, internships, research, study abroad, and more. Learn how a **Combined Accelerated Pathway** can prepare you for your future, faster.

Game Design and Development, BS/MS degree, typical course sequence

Course		Sem. Cr. Hrs.
First Year		
IGME-105	**General Education – Elective: Game Development and Algorithmic Problem Solving I**	4

This course introduces students within the domain of game design and development to the fundamentals of computing through problem solving, abstraction, and algorithmic design. Students will learn the basic elements of game software development, including problem decomposition, the design and implementation of game applications, and the testing/debugging of their designs. (This course is restricted to GAMEDES-BS Major students.) Lec/Lab 6 (Fall, Spring).

IGME-106	**General Education – Elective: Game Development and Algorithmic Problem Solving II**	4

This course furthers the exploration of problem solving, abstraction, and algorithmic design. Students apply the object-oriented paradigm of software development, with emphasis upon fundamental concepts of encapsulation, inheritance, and polymorphism. In addition, object structures and class relationships comprise a key portion of the analytical process including the exploration of problem structure and refactoring. Intermediate concepts in software design including GUIs, threads, events, networking, and advanced APIs are also explored. Students are also introduced to data structures, algorithms, exception handling and design patterns that are relevant to the construction of game systems. (Prerequisites: C- or better in IGME-105 or equivalent course and student standing in the GAMEDES-BS program.) Lec/Lab 6 (Fall, Spring).

IGME-110	**General Education – Elective: Introduction to Interactive Media**	3

This course provides an overview of media in historical, current and future contexts. Incorporating lectures and discussion with hands on work involving written and interactive media assets, students examine the role of written and visual media from theoretical as well as practical perspectives. The course also provides an introduction to interactive media development techniques, including digital media components and delivery environments. Students will be required to write formal analysis and critique papers along with digital modes of writing including collaborative editing and effective presentation design. (This course is restricted to 1st - 3rd year students in NWMEDID-BS and GAMEDES-BS.) Lab 3, Lecture 3 (Fall, Spring).

IGME-119	**2D Animation and Asset Production**	3

This course provides a theoretical framework covering the principles of animation and its use in game design to affect user experience. Emphasis will be placed upon principles that support character development and animations that show cause and effect. Students will apply these principles to create animations that reflect movement and character appropriate for different uses and environments. (This course is restricted to students in GAMEDES-BS or NWMEDID-BS or GAMED-MN students.) Lec/Lab 3 (Fall, Spring).

MATH-131	**General Education – Math Perspective A: Discrete Mathematics**	4

This course is an introduction to the topics of discrete mathematics, including number systems, sets and logic, relations, combinatorial methods, graph theory, regular sets, vectors, and matrices. (Prerequisites: MATH-101, MATH-111, NMTH-260, NMTH-272 or NMTH-275 or a Math Placement Exam score of at least 35.) Lecture 4 (Fall, Spring).

MATH-185	**General Education – Math Perspective B: Mathematics of Graphical Simulation I**	3

This is the first part of a two course sequence that aims at providing the mathematical tools needed to manipulate graphical objects and to model and simulate the physical properties of these objects. Topics from linear algebra, primarily in two and three dimensional space, analytic geometry, and calculus will be presented. The emphasis is on linear algebra, particularly its application to problems in geometry and graphical systems. (Prerequisites: MATH-101 or MATH-111 or MATH-131 or NMTH-260 or NMTH-272 or NMTH-275 or equivalent course.) Lecture 3 (Spring).

PHYS-111	**General Education – Natural Science Inquiry Perspective: College Physics I**	4

This is an introductory course in algebra-based physics focusing on mechanics and waves. Topics include kinematics, planar motion, Newton's laws, gravitation; rotational kinematics and dynamics; work and energy; momentum and impulse; conservation laws; simple harmonic motion; waves; data presentation/analysis and error propagation. The course is taught using both traditional lectures and a workshop format that integrates material traditionally found in separate lecture, recitation, and laboratory settings. Lab 4, Lecture 2 (Fall, Spring, Summer).

YOPS-10	**RIT 365: RIT Connections**	0

RIT 365 students participate in experiential learning opportunities designed to launch them into their career at RIT, support them in making multiple and varied connections across the university, and immerse them in processes of competency development. Students will plan for and reflect on their first-year experiences, receive feedback, and develop a personal plan for future action in order to develop foundational self-awareness and recognize broad-based professional competencies. Lecture 1 (Fall, Spring).

	General Education – First-Year Writing (WI)	3
	General Education – Global Perspective	3
	General Education – Social Perspective	3

Second Year

IGME-099	**Co-op Preparation Workshop**	0

This course helps students prepare for co-operative education employment ("co-op") by developing job search strategies and material. Students will explore current and emerging aspects of IGM fields to help focus their skill development strategies. Students are introduced to RIT's Office of Career Services and Cooperative Education, and learn about professional and ethical responsibilities for their co-op and subsequent professional experiences. Students will work collaboratively to build résumés and digital portfolios, and to prepare for interview situations. (This course is restricted to NWMEDID-BS or GAMEDES-BS or COMPEX-UND students with at least second year standing.) Lecture 1 (Fall, Spring).

IGME-202	**Interactive Media Development**	3

In this course, students will learn to create visually rich interactive experiences. It is a course in programming graphics and media, but it is also a course on the relationship between ideas and code. Students will explore topics in math and physics by building programs that simulate and visualize processes in the natural world. Assignments will include major programming projects, such as building a virtual world inhabited by digital creatures that display observable behaviors. (Prerequisites: (C- or better in IGME-106 or IGME-116 or IGME-206 or IGME-201) and MATH-185 or equivalent courses and GAMEDES-BS or NWMEDID-BS Major or GAMEDD-MN students.) Lec/Lab 3 (Fall, Spring).

IGME-209	**Data Structures and Algorithms for Games and Simulations I**	3

This course focuses upon the application of data structures, algorithms, and fundamental Newtonian physics to the development of video game applications, entertainment software titles, and simulations. Topics covered include 3D coordinate systems and the implementation of affine transformations, geometric primitives, and efficient data structures and algorithms for real-time collision detection. Furthermore, Newtonian mechanics principles will be examined in the context of developing game and entertainment software where they will be applied to compute the position, velocity and acceleration of a point-mass subject to forces and the conservation of momentum and energy. Programming assignments are a required part of this course. (Prerequisites: (C- or better in IGME-116 or IGME-106 or IGME-206 or IGME-201 or equivalent course and GAMEDES-BS or NWMEDID-BS students) or (C- or better in CSCI-140 or CSCI-142 or CSCI-242 or ISTE-121 or equivalent course and GAMEDD-MN students).) Lab 3 (Fall, Spring).

IGME-219	**3D Animation and Asset Production**	3

This course provides an overview of 3D game asset production. Basic ideas learned within the first asset production course are also revisited within the 3D environs. Topics covered include modeling, texturing, skinning and animation. Emphasis is put on low polygon modeling techniques, best practices in game art production, and effective communication strategies between artists, programmers and designers. (Prerequisites: IGME-119 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Fall, Spring).

IGME-220	**Game Design & Development I**	3

This course examines the core process of game design, from ideation and structured brainstorming in an entertainment technology context through the examination of industry standard processes and techniques for documenting and managing the design process. This course specifically examines techniques for assessing and quantifying the validity of a given design, for managing innovation and creativity in a game development-specific context, and for world and character design. Specific emphasis is placed on both the examination and deconstruction of historical successes and failures, along with presentation of ethical and cultural issues related to the design and development of interactive software and the role of individuals in a team-oriented design methodology. Students in this class are expected to actively participate and engage in the culture of design and critique as it relates to the field. (This course is restricted to students in GAMEDES-BS or NWMEDID-BS or GAMED-MN or GAMEDD-MN YR 2-5 students.) Lec/Lab 3 (Fall, Spring).

IGME-235	**Introduction to Web Technology for Game Developers**	3

This course introduces web technologies commonly used in the production and distribution of both content focused web sites, and in the creation of interactive applications and games. Students will create web sites and web-native interactive experiences, and publish them to the web. Programming projects are required. (Students must be in GAMEDES-BS or NWMEDID-BS and have completed (IGME-102, IGME-106, IGME-116 or IGME-206) and IGME-110. Students cannot take and receive credit for this course if they have taken IGME-230.) Lecture 3 (Fall, Spring).

IGME-236	**Interaction, Immersion, & the Media Interface (WI-PR)**	3

This course examines the concepts of interface and interaction models in a media-specific context, with particular emphasis on the concept of the immersive interface. This course explores concepts such as perception, expectation, Gestalt Theory, interactivity, Semiotics, presence, and immersion in the context of media application development and deployment. In addition, underlying concepts of cognitive psychology and cognitive science will be integrated where appropriate. These theories are then integrated in the exploration of the immersive interface, and with related concepts such as user-level-interface modification, augmentation of identity, and the interface as a social catalyst. (Prerequisites: (IGME-102 or IGME-106 or IGME-206) and IGME-110 or equivalent courses and in GAMEDES-BS or NWMEDID-BS programs.) Lec/Lab 3 (Fall, Spring).

IGME-499	**Undergraduate Co-op (summer)**	0

Cooperative education is a work experience designed to supplement the educational process. Students may select from a range of activities designated as cooperative education, including relevant industrial experience, internships, entrepreneurial activities, as well as faculty-supervised research and innovation opportunities. (Prerequisite: IGME-99 or equivalent course.) CO OP (Fall, Spring, Summer).

	General Education – Ethical Perspective	3
	General Education – Artistic Perspective	3
	General Education – Scientific Principles Perspective	3
	General Education – Mathematics Course†	3

Third Year

IGME-309	**Data Structures and Algorithms for Games and Simulations II**	3

This course continues the investigation into the application of data structures, algorithms, and fundamental Newtonian mechanics required for the development of video game applications, simulations, and entertainment software titles. Topics covered include quaternion representation of orientation and displacement, cubic curves and surfaces, classifiers, recursive generation of geometric structures, texture mapping, and the implementation of algorithms within game physics engines for collision detection and collision resolution of rigid bodies, and the numerical integration of the equations of motion. In addition, advanced data structures such as B+ trees and graphs will be investigated from the context of game application and entertainment software development. Programming assignments are a requirement for this course. (Prerequisites: IGME-209 and (MATH-171 or MATH-181 or MATH-181A) and (MATH-185 or MATH-241) and (PHYS-111 or PHYS-211 or (PHYS-206 and PHYS-208)) or equivalent courses and student standing in GAMEDES-BS or NWMEDID-BS or GAMEDD-MN.) Lec/Lab 3 (Fall, Spring).

IGME-320	**Game Design and Development II**	3

This course continues to examine the core theories of game design as they relate to the professional field. Beginning with a formalized pitch process, this course examines the design and development paradigm from story-boarding and pre-visualization through rapid iteration, refinement, and structured prototyping exercises to further examine the validity of a given design. Specific emphasis is placed on iterative prototyping models, and on methodologies for both informal and formal critique. This course also explores production techniques and life-cycle in the professional industry. (Prerequisites: (IGME-202 and IGME-220 or equivalent courses and GAMEDES-BS or NWMEDID-BS or GAMEDD-MN students) or (IGME-102 and IGME-220 or equivalent courses and GAMED-MN students).) Lec/Lab 3 (Fall, Spring).

Choose one of the following:		3
IGME-330	**Rich Media Web Application Development I**	

This course provides students the opportunity to explore the design and development of media-rich web applications that utilize both static and procedurally manipulated media such as text, images and audio. This course examines client and server-side web development and features common to such applications. Issues explored include framework characteristics, information management, presentation, interactivity, persistence, and data binding. Programming projects are required. (Prerequisites: IGME-230 or IGME-235 or equivalent course and student standing in GAMEDES-BS or NWMEDID-BS.) Lec/Lab 3 (Fall, Spring).

IGME-330H	Honors Rich Media Web Application Development I	
IGME-499	**Undergraduate Co-op**	0

Cooperative education is a work experience designed to supplement the educational process. Students may select from a range of activities designated as cooperative education, including relevant industrial experience, internships, entrepreneurial activities, as well as faculty-supervised research and innovation opportunities. (Prerequisite: IGME-99 or equivalent course.) CO OP (Fall, Spring, Summer).

	General Education – Immersion 1, 2	6
	General Education – Electives	6
	Advanced Elective	3
	Open Electives	6

Fourth Year

IGME-795	**Game Industry Themes and Perspectives**	1

This required course prepares students for a career in the field of game design and development. Students will attend lectures by and discussions with RIT faculty and visitors and produce material to assist in their career preparation. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 2 (Fall).

IGME-601	**Game Development Processes**	3

This course examines the individual and group roles of the development process model within the game design and development industry. Students will transform design document specifications into software and hardware needs for developers, testers, and end users. Students will examine team dynamics and processes for technical development, content development, testing, deployment, and maintenance. Students will explore the design process through the deconstruction of the game industry's software lifecycle model. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall).

IGME-602	**Game Design**	3

This course presents students with core theories of game design, informed by research results from media theory, narrative methods and models, theories of ideation, and the nature of games, play and fun. Specific emphasis is placed on the examination of historical successes and failures, along with presentation of ethical and cultural issues related to the design of interactive software. Students will engage in formal critique and analysis of media designs and their formal elements. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall).

IGME-603	**Gameplay and Prototyping**	3

This course explores the pragmatic issues of creative concept development through story-boarding, pitching, prototyping and play-testing. Students will use various tools and techniques to build game prototypes that they will evaluate through play-testing in an incremental design process informed by market research and analysis. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall).

IGME-695	**Colloquium in Game Design and Development**	1

This required colloquium will introduce students to a range of emerging topics and themes in the field of game design and development. Students will attend lectures by and discussions with RIT faculty and visitors, complete related readings, and offer both oral and written responses to readings and presentations. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 2 (Fall, Spring).

	Graduate IGM Electives	6
	Open Elective	3
	General Education – Immersion 3	3
	General Education – Electives	9

Fifth Year

IGME-695	**Colloquium in Game Design and Development**	1

This required colloquium will introduce students to a range of emerging topics and themes in the field of game design and development. Students will attend lectures by and discussions with RIT faculty and visitors, complete related readings, and offer both oral and written responses to readings and presentations. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 2 (Fall, Spring).

IGME-788	**Capstone Design**	3

This course allows students within the game design and development program to develop a capstone proposal and design document. The capstone design document specifies the scope and depth of the capstone project. In addition, it defines the group and individual responsibilities for the cohort capstone project experience. (Prerequisites: IGME-601 and IGME-602 and IGME-603 or equivalent courses.) Lecture 5 (Fall).

IGME-789	**Capstone Development**	3

This course provides master of science in game design and development students with capstone project experiences. Students are expected to work in cohorts towards the implementation of a game system that properly illustrates proficiency in the application of theory and practice towards a large-scale project. For each student, individual responsibilities for the group project will be defined in consultation with both the group and the faculty. Students must successfully complete the Capstone Design course and present a satisfactory capstone project proposal to the faculty before enrolling in this course. (Prerequisites: IGME-788 or equivalent course.) Lec/Lab 5 (Spring).

	Graduate IGM Electives	9
	Open Electives	6
Total Semester Credit Hours		148

Please see General Education Curriculum (GE) for more information.

(WI) Refers to a writing intensive course within the major.

Please see Wellness Education Requirement for more information. Students completing bachelor's degrees are required to complete two different Wellness courses.

† Student may select one of the following math courses: Mathematics of Graphical Simulation II (MATH-186), Calculus A (MATH-171), Project-Based Calculus I (MATH-181), or Calculus I (MATH-181A).

IGM/Graduate Advanced Electives

IGME-621 **Board and Card Game Design and Development**

This course explores issues pertaining to design, mechanics, development, and production of analog, tabletop “hobby” games, which include board games, card games, wargames, and other non-digital games catering to multiple players. Students will analyze and apply concepts and mechanics of modern tabletop game design, and build and test both competitive and cooperative tabletop games, designed specifically for a global audience. Students will work with development and prototyping tools, explore component design and art direction, and work with desktop publishing technologies. In addition, they will work directly with board game publishing and manufacturing technologies and services, and study factors pertaining to the business of tabletop games, and produce a professional, polished tabletop game. (Prerequisites: (IGME-602 and student is matriculated in GAMEDES-MS); or (IGME-220 and student is matriculated in GAMEDES-BS/NWMEDID-BS)) Lecture 3 (Spring).

IGME-622 **Game Balance**

This course is an in-depth exploration of the sub-field of game design known as balance. Topics include: transitive mechanics and cost/power curves; economic systems in games; probability and the psychology of randomness; pseudorandom numbers; situational balance; level/XP curves, advancement and pacing; tuning; statistics, metrics, and analytics; intransitive mechanics, game theory, and payoff matrices; and the applied use of spreadsheets. (This course is restricted to students in the GAMEDES-MS program.) Lecture 3 (Fall).

IGME-623 **Theory and Design of Role Play and Interactive Narrative**

Role playing games (RPGs) are among the most popular game forms. RPG design incorporates elements from most game genre. This course will address all aspects of design relevant to role play, both digital and analog, and the course will focus on the underlying theory of role play as a practice. We will talk about popular games, but will also spend time on experimental and innovative role play. Students should expect to study playing styles, RPG structure, and to both study and produce effective interactive narrative. Lab 3 (Spring).

IGME-624 **Table Top Role-Playing Game Design and Development**

This course explores the concepts and mechanics of analog role-playing games, such as tabletop "pencil-and-paper" and live-action role-playing games, from a practical, hands-on perspective. In this project-based course, students will develop their own rule systems to facilitate various facets of role-playing and associated game mechanics, then playtest and publish their games. Students will also use desktop publishing tools to produce game rules and supplemental materials suitable for publication. Note that this course assumes that students have extensive experience in playing tabletop role-playing games. (Prerequisites: (IGME-602 and student is matriculated in GAMEDES-MS); or (IGME-220 and student is matriculated in GAMEDES-BS/NWMEDID-BS)) Lecture 3 (Fall, Spring).

IGME-670 **Digital Audio Production**

Technologies and techniques for producing and manipulating digital audio are explored. Topics include digital representations of sound, digital audio recording and production, MIDI, synthesis techniques, real-time performance issues, and the application of digital audio to multimedia and Web production. (Students must be in GAMEDES-MS or GAMEDES-BS and have taken IGME-202. Undergraduate students may not take and receive credit for this course if they have already taken IGME-570.) Lec/Lab 3 (Fall).

IGME-671 **Interactive Game and Audio**

This course provides students with exposure to the design, creation and production of audio in interactive applications and computer games. Students will become familiar with the use of sound libraries, recording sounds in the studio and in the field, generating sound with synthesizers, and effects processing. Students will create sound designs for interactive media, integrating music, dialog, ambient sound, sound effects and interface sounds within interactive programs. (Students must be in GAMEDES-MS or GAMEDES-BS and have taken IGME-202. Undergraduate students may not take and receive credit for this course if they have already taken IGME-571.not if IGME-571) Lec/Lab 3 (Spring).

IGME-680 **IGM Production Studio**

This course will allow students to work as domain specialists on teams completing one or more large projects over the course of the semester. The projects will be relevant to experiences of the interactive games and media programs, but they will require expertise in a variety of sub-domains, including web design and development, social computing, computer game development, multi-user media, human-computer interaction and streaming media. Students will learn to apply concepts of project management and scheduling, production roles and responsibilities, and their domain skill sets to multidisciplinary projects. Students will complete design documents, progress reports and final assessments of themselves and their teammates in addition to completing their assigned responsibilities on the main projects. (Prerequisites: IGME-601 or equivalent courses.) Lec/Lab 3 (Fall, Spring).

IGME-681 **Innovation & Invention**

In this course, students explore the process and products of innovation and invention. Each semester we conceive and develop a different outside the box project in a multidisciplinary tinkerer's lab. Readings, lectures, student presentations, and discussions deal with the interplay of technology, human nature, and a human environment in which emerging technologies and new modes of interaction are pervasive and ubiquitous. Students from multiple disciplines are guided through a series of collaborative experiences inventing, designing, implementing and studying emerging technologies and their educational and artistic potential. Presentations, projects and individual research papers are required. (This course requires permission of the Instructor to enroll.) Lec/Lab 3 (Fall, Spring).

IGME-690 **IGM Seminar**

This is intended to allow for special one-time offerings of graduate topics. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given seminar offering. (Varies) (This course is restricted to GAMEDES-MS students or (GAMEDES-BS or NWMEDID-BS students with at least 3rd year standing).) Lecture (Fall, Spring, Summer).

IGME-730 **Game Design and Development for Casual and Mobile Platforms**

This course explores the design and development of casual and mobile game applications. Students will begin by exploring the design practices relevant to casual and mobile games, including hardware constraints, player expectations, play experiences, mechanics for casual and mobile experiences, as well as the aesthetics and presentation of casual and mobile game elements. As students learn the theoretical concepts, they will also learn the development process for casual and mobile games. Development topics will include technology platforms, physical and logical interface control, graphics and interaction, tools and APIs, connectivity, data management, data persistence, delivery mechanisms, and systems integration with desktop and web-based platforms. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Spring).

IGME-740 **Game Graphics Programming**

Students will explore the use of an advanced graphics API to access hardware-accelerated graphics in a real-time graphics engine context. The course will involve discussion of scene graphs, optimizations, and integration with the API object structure, as well as input schemes, content pipelines, and 2D and 3D rendering techniques. Students will also explore the advanced use of the API calls in production code to construct environments capable of real-time performance. Students will construct from scratch a fully functional graphics engine, with library construction for game development. Advanced topics will be explored, including real-time special effects, custom shading pipelines, and advanced deferred rendering techniques. (Prerequisites: IGME-601 or equivalent courses.) Lec/Lab 3 (Spring).

IGME-742 **Level Design**

This course introduces level design theory and best practice through game level analysis, evaluation, and creation. Students will explore the history of various game genres and the design of their levels, analyze game levels from existing games, and discuss what made those levels successful or unsuccessful. Through their analysis and hands-on experience, students will gain an understanding of overall level design including layout, flow, pacing, narrative, and balance. They will enhance their understanding of level design principles by creating their own game levels. (Prerequisites: IGME-602 or equivalent courses.) Lab 3 (Fall, Spring).

IGME-750 **Game Engine Design and Development**

This course will provide students with theory and practical skills in game engine design topic areas such as understanding the graphics pipeline as it influences engine design, hardware principles and the relationship to game engine construction, mathematical principles involved in game engine design, scene graph construction and maintenance, texture and materials management, collision systems, physics systems, particle systems, and control systems. Furthermore, this course will examine software and toolsets that assist game engine designers in their tasks. Students will be expected to design and implement a game engine in teams as well as properly document their design and development strategy. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall).

IGME-753 **Console Development**

This course explores the history and modern implementation of software for game consoles. Cross-platform development will be emphasized along with software concepts such as memory management, scheduling, parallelization, graphics, and virtual reality. Programming projects are required. (Prerequisite: IGME-740 or equivalent course.) Lecture 3 (Fall).

IGME-760 **Artificial Intelligence for Gameplay**

This course explores artificial intelligence concepts and research through both a theoretical perspective and a practical application to game development. In particular the course focuses on AI concepts and paradigms such as search and representation, reasoning under uncertainty, intelligent agents, biologically inspired computing and machine learning to real-time situations and applications as relevant to the field of entertainment technology and simulation. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall).

IGME-790 **Graduate Seminar in IGM**

This is intended to allow for special one-time offerings of graduate topics. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given seminar offering. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab (Fall, Spring, Summer).

IGME-796 **Advanced Topics in Game Design**

This course examines current topics in game design. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall, Spring, Summer).

IGME-797 **Advanced Topics in Game Development**

This course examines current topics in game development. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area. (This course is restricted to students in the GAMEDES-MS program.) Lec/Lab 3 (Fall, Spring, Summer).

IGME-799 **Independent Study**

The student will work independently under the supervision of a faculty adviser on a topic not covered in other courses. (Enrollment in this course requires permission from the department offering the course.) Ind Study (Fall, Spring, Summer).

CSCI-610 **Foundations of Computer Graphics**

Foundations of Computer Graphics is a study of the hardware and software principles of interactive raster graphics. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, projections, rendering techniques, graphical software packages and graphics systems. The course will focus on rasterization techniques and emphasize the hardware rasterization pipeline including the use of hardware shaders. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms. Programming projects and a survey of the current graphics literature will be required. Note: students who complete CSCI-510 may not take CSCI-610 for credit. (Prerequisite: (CSCI-603 or CSCI-605 with a grade of B or better) or (CSCI-243 or SWEN-262). May not take and receive credit for CSCI-610 and CSCI-510. If earned credit for/or currently enrolled in CSCI-510 you will not be permitted to enroll in CSCI-610.) Lecture 3 (Fall, Spring).

CSCI-711 **Global Illumination**

This course will investigate the theory of global illumination (GI) in computer image synthesis. Seminal computer graphics papers will be used to explore the various components of the GI pipeline and explain 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 GI rendering tools and libraries available for image synthesis. The student will put theory into practice via a set of programming assignments and a capstone project. Topics will include light and color, three-dimensional scene specification, camera models, surface materials and textures, GI rendering methods, procedural shading, tone reproduction, and advanced rendering techniques. Readings and summaries of Computer Graphics literature will be required. (Prerequisites: CSCI-610 or CSCI-510 or equivalent course.) Lecture 3 (Fall, Spring).

CSCI-712 **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). Readings and summaries of Computer Graphics literature will be required. Offered every other year. (Prerequisites: CSCI-610 or CSCI-510 or 4005-762 or 4003-570 or equivalent course.) Lecture 3 (Fall).

CSCI-713 **Applied Perception in Graphics and Visualization**

The goal of this course is to introduce students to the field of applied perception in graphics and visualization and demonstrate how it has contributed to the development of better display systems and computer graphics rendering techniques. The delivery of the course material will be done primarily through lectures with biweekly programming assignments based upon the techniques presented in class. Students will also be exposed to a wide range of technical papers and be expected to make classroom presentations on selected topics in the field of applied perception in graphics and visualization. (Prerequisites: CSCI-610 or CSCI-510 or 4005-762 or 4003-571 or equivalent course.) Lecture 3 (Spring).