DigiPen
INSTITUTE OF TECHNOLOGY
SINGAPORE

COURSE CATALOG
ADDENDUM

2015-2016
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ACADEMIC CALENDAR

- **August 28, 2015**
  Student Orientation

- **August 31, 2015**
  Fall Semester – Classes Begin

- **September 7, 2015**
  Last day to add courses for Fall semester.

- **September 11, 2015**
  Polling Day Observed*
  No Classes

- **September 14, 2015**
  Final day to drop courses for Fall semester without academic penalty.

- **September 15, 2015**
  Last day to submit requests for Independent Study, Special Topics, and additional courses not included in tentative course list for Spring semester.

- **September 24, 2015**
  Hari Raya Haji Observed*
  No Classes

- **October 25, 2015**
  Final day to drop a course for Fall semester. Withdrawals from the Institute on and before this date will receive a 'W' on transcript. Withdrawals from the Institute after this date will receive 'F' grades on transcript.

- **November 10, 2015**
  Deepavali Observed*
  No Classes

- **November 23, 2015**
  Last day to submit the following requests for Spring 2016: Registration for Spring 2016 courses. Request for Transfer/Waiver Credit. Requests for Change of Major.

- **December 7-11, 2015**
  Fall Semester Final Exams

- **December 11, 2015**
  Fall Semester Ends

- **December 12, 2015-January 3, 2016**
  Winter Break
  No Classes

- **January 2-3, 2016**
  Intersession
  No Classes

- **January 4, 2016**
  Spring Semester – Classes Begin

- **January 11, 2016**
  Last day to add courses for Spring semester.

- **January 18, 2016**
  Final day to drop a course for Spring semester without academic penalty.

- **January 19, 2016**
  Last day to submit requests for Independent Study, Special Topics and additional courses not included in tentative course list for Summer session.

- **February 3, 2016**
  Founder's Day Observed*
  No Classes

- **February 8-9, 2016**
  Chinese New Year Observed*
  No Classes

- **February 28, 2016**
  Final day to drop a course for Spring semester. Withdrawals from the Institute on or before this date will receive a 'W' on transcript. Withdrawals from the Institute after this date will receive 'F' grades on transcript.

- **March 25, 2016**
  Good Friday Observed*
  No Classes

- **March 28, 2016**
  Last day to submit the following requests for Summer 2016: Registration for Summer 2016 courses. Request for Transfer/Waiver Credit. Request for Change of Major.

- **April 11-15, 2016**
  Spring Semester Final Exams

- **April 15, 2016**
  Spring Semester Ends

- **April 16-May 2, 2016**
  Intersession
  No Classes

- **May 3, 2016**
  Summer Semester – Classes Begin

- **May 9, 2016**
  Last day to add courses for Summer session.

- **May 16, 2016**
  Final day to drop courses for Summer session without academic penalty.

- **May 17, 2016**
  Final day to submit requests for Independent Study, Special Topics, and additional courses not included in tentative course list for Fall semester.

- **May 21, 2016**
  Vesak Day Observed*
  No Classes

- **June 26, 2016**
  Final day to drop a course for summer semester. Withdrawals from the institute on and before this date will receive a 'W' on transcript. Withdrawals from the Institute after this date will receive 'F' grades on transcript.

- **July 6, 2016**
  Hari Raya Puasa Observed*
  No Classes

- **July 25, 2016**
  Last day to submit the following requests for Fall 2016: Registration for Fall 2016 courses. Request for Transfer/Waiver Credit. Request for Change of Major.

- **August 8-12, 2016**
  Summer Semester Final Exams

- **August 9, 2016**
  National Day Observed*
  No Classes

- **August 12, 2016**
  Summer Semester Ends

Singapore Public Holiday. The Institute is closed on all public holidays. If a public holiday falls on a Sunday, the following Monday will be a public holiday. Singapore public holidays that fall during normal intersessions (i.e. Christmas Day) have not been listed. Exam periods and breaks may be subject to change. The laboratory facilities may be closed for a period of two consecutive days per month for maintenance, usually at the last two working days of the month unless otherwise posted.

General Policies

INSTITUTIONAL MISSION
[Updated: March 2015]
[Revision of content.]

DigiPen Institute of Technology provides exemplary education and furthers research and innovation in science, engineering, arts, digital media, and interactive computer technologies. Building on a foundation of academics, applied learning, industry knowledge, and multi-disciplinary team-based collaboration, we inspire our students to pursue lifelong learning as well as scientific and creative exploration, and empower them to become leaders and originators on a global level.

Waiver Credit, Advanced Placement Examinations, CLEP
[Updated: June 2015]
[Addition of AP Physics – Electricity and Magnetism.]

Advanced Placement Examinations

Course waivers or credit may be granted for satisfactory achievement on Advanced Placement (AP) Exams of the College Entrance Examination Board taken within the last 10 years. AP exams must have been taken prior to the applicant's graduation from high school. No grades will be assigned to the courses, nor will they be figured into a student's grade point average. Courses waived or transferred are entered on a student's transcripts, but no grades or quality points are awarded. Official results must be sent to the Registrar before course waivers or transfers are granted.

The Institute's course credits may be waived or transferred if a student obtained the minimum score on the AP examination corresponding to the Digipen course (as listed below), and these may be applied to satisfy the Institute's degree requirements.

ACCEPTED AP SCORES AND DIGIPEN COURSE EQUIVALENTS

AP EXAM	MINIMUM SCORE	DIGIPEN COURSE
Art – History of Art	4	ART 210
English – Literature and Composition	4	ENG 110
English – Language and Composition	4	ENG 110
History – World History	4	HIS 100
Japanese	4	JPN 101
Mathematics – Calculus AB	4	MAT 150
Mathematics – Calculus BC	4	MAT 200
Music Theory	4	MUS 120 & MUS 120L
AP Physics – Electricity and Magnetism	4	PHY 270
Physics B – Physics (Introduction)	4	PHY 115
Physics C – Physics (Mechanical)	4	PHY 200
Psychology	4	PSY 101

Student Internships
[Updated: June 2015]
[Revision of content.]

OVERVIEW OF INTERNSHIPS

Student internships are monitored, on-site work or service experiences for which students earn credit. Students who meet the prerequisites and are in good academic standing are eligible for internships.

Internships can be arranged for any setting related to a student's career goals. The internship usually takes place in a professional workplace under the supervision of an experienced professional, whereby a high degree of responsibility is placed on the student. Internships can be part-time or full-time and must be paid. Internships must be approved in advance by the Institute.

GENERAL INFORMATION REGARDING INTERNSHIP PROGRAMS

Through an internship program, students establish and meet intentional learning goals through actual product development experience, while actively reflecting on what they are learning throughout the experience. The goals for the internship may include:

- Academic learning—applying knowledge learned in the classroom to tasks in the workplace.
- Career development—gaining knowledge necessary to meet minimum qualifications for a position in the student's field of interest.
- Skill development—an understanding of the skills and knowledge required in a specific job category.
- Personal development—gaining decision-making skills, critical thinking skills, and increased confidence and self-esteem.

Since internships have a strong academic component, students are carefully monitored and evaluated for academic credit. Internships may vary in duration but generally last for one semester (3-4 months) and credit is granted based on 45 hours of internship per credit. For example, 5 credits (225 hours) and 3 credits (135 hours). Typically, students may replace two semesters of their respective program's projects courses. Please refer to individual program requirements for more information. Undergraduate students may not replace more than 10 internship credits and Master's students may not keep more than 6 internship credits).

More detailed information about student internships can be found in the Internship Guidelines available in the Office of Student Affairs.

Change of Major and Graduation

[Updated: June 2015]
[Addition of Graduating with Academic Honors section.]

IMPORTANT INFORMATION REGARDING CHANGE OF MAJOR REQUESTS

- Change of majors will only take effect on the first day of a new semester. To be considered, requests must be submitted at least fifteen working days before the end of the current semester; otherwise, the request will be considered for the next available semester.

- Students requesting a change of major should remember to consider add/drop deadlines. Requests for change of majors do not exempt students from the add/drop policies at the Institute.

- Students may register for classes in any major prior to the deadline for adding a class, but it is recommended that they speak to their academic advisors if they have not yet had their requests for a change of major approved.

- Students should speak to the degree program faculty if they have specific questions about transferring from one degree program to another.

Any questions about the status of a change of major request or about this process should be directed to the Admissions Office.

GRADUATING WITH ACADEMIC HONORS

DigiPen Institute of Technology recognizes and commends students whose cumulative GPA indicates distinguished academic accomplishment upon the completion of the program.

Graduate students who graduate with a cumulative GPA of 3.7 or above are recognized as Graduating with Distinction.

Undergraduate students who graduate with a cumulative GPA of 3.85-4.0 are recognized as graduating Summa Cum Laude.

Undergraduate students who graduate with a cumulative GPA of 3.7-3.84 are recognized as graduating Magna Cum Laude.

Undergraduate students who graduate with a cumulative GPA of 3.5-3.69 are recognized as graduating Cum Laude.

Degree Programs for the Academic Year 2015-2016

Bachelor of Science in Computer Science and Real-Time Interactive Simulation

The real-time interactive simulation field, which includes the software and digital entertainment industries, is one of the fastest growing and most exciting career choices of the future. The video game, movie, and military industries are only a few of those that demand well-trained, enthusiastic programmers, designers, artists, and managers. DigiPen Institute of Technology is a key provider of these individuals, and the Bachelor of Science in Computer Science in Real-Time Interactive Simulation degree program prepares programmers for these industries. Designed and developed by industry experts and DigiPen faculty, the Institute's four-year BS in Computer Science in Real-Time Interactive Simulation degree program is a computer science degree that is highly focused on the areas of graphics and simulations. Participants in the BS in Computer Science in Real-Time Interactive Simulation degree program specialize in the skills and tools necessary to create realtime simulations of real-life events and imaginary situations.

The BS in Computer Science in Real-Time Interactive Simulation degree program offers extensive training in mathematics and physics as a foundation for the various topics presented in general computer science and computer graphics. Throughout the degree program, BS in Computer Science in Real-Time Interactive Simulation students participate in several teambased projects. These substantial projects are designed to give students concrete experiences in which they apply the theoretical knowledge gained from their courses. Forming the cornerstone of the program, these projects exemplify many of the skills necessary in the video game industry today: teamwork, design, implementation, follow through, and business knowledge, among others. BS in Computer Science in RealTime Interactive Simulation students gain the experience of designing, programming, and testing a variety of simulations and games, including text-based, scrolling, simulation, and 2D and 3D games.

Students in this degree program work both individually and collaboratively to learn the fundamentals of software programming, game design, and production. Additionally, they write game design documents and technical design documents, learn how to schedule tools and techniques, and participate in the full production of several games. These game-oriented productions are a perfect media to present complicated subjects in a format agreeable to students. These productions:

- are graphics-oriented simulations, including 2D and 3D simulations.
- Can realistically reproduce or simulate natural phenomena and real-life events.
- Flight simulators are excellent examples of such simulations.

- are highly interactive, requiring an elaborate and efficient graphical user interface (GUI). The development of a GUI requires the management of windows, menus, dialog boxes, and hardware resources including keyboards, mice, and display monitors.
- React in real time. The implementation of such simulations requires a thorough knowledge of computer hardware and computer languages.
- Are story-based simulation requiring a plot in which game objects must interact intelligently with each other. Therefore, in order to make games challenging and interesting, students must design and implement good artificial intelligence algorithms, which serve as the cognitive processes for the computer-controlled game objects.
- Could be designed for either a single-player or multi-player environment. The development of the latter requires the understanding of subjects such as computer networks, TCP/IP, and internet programming.
- Are excellent examples of large and complex productions. Teamwork is essential to the successful completion of such productions. Therefore, students are divided into teams and are rigorously trained in object-oriented programming languages, paradigms, and software engineering techniques and practices.

Graduates of this degree program will be prepared to enter the video game industry as entry-level computer scientists and software engineers. Possible entry-level position titles include Computer Scientist, Software Engineer, Software Developer, Software Development Engineer, Software Development Engineer in Test, Software Analyst, Computer Programmer, Gameplay Programmer, Engine Programmer, Physics Programmer, Graphics Programmer, Networking Programmer, Artificial Intelligence Programmer, User Interface Programmer, Tools Programmer, Web Programmer, or Game Scripter. After several years in the industry, graduates may attain titles such as Lead Engineer, Lead Developer, Development Manager, Principal Engineer, Technical Director, and Chief Technology Officer. This degree program also includes secondary training that can contribute directly to a graduate obtaining positions with titles such as Producer, Program Manager, Technical Program Manager, Technical Writer, and Technical Designer.

Degree Requirements

NUMBER OF CREDITS AND GPA
The BS in Computer Science and Real-Time Interactive Simulation requires completion of at least 154 credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of 15 weeks each, or a total of four academic years.

GRADE REQUIREMENTS AND CORE COURSES
Students must receive a grade of "C-" (or 1.7 quality points) or higher in all core courses for the BS in Computer Science and Real-Time Interactive Simulation major. (In a non-core course, a grade of "D" [or 1.0 quality points] or higher is considered

passing.) The core courses are all those taken to fulfill the GAM, MAT, and CS requirements. PHY 200 is also a core course.

ART AND MUSIC
The following courses are required: ART 210, CG 130 and 2 additional credits from the following: ANI 125, ART 400, ART 410, FLM 115, FLM 151, FLM 152, or MUS 115. (Total: 7 credits)

COMPUTER SCIENCE
The following courses are required: CS 100, CS 120, CS 170, CS 180, CS 200, CS 225, CS 230, CS 250, CS 260, CS 280, CS 300, CS 315, CS 330, CS 350, and CS 365. Students must select four more courses (12 credits) numbered higher than 200. (Total: 60 credits)

HUMANITIES AND SOCIAL SCIENCES
The following courses are required: COL 499, ENG 110, and COM 150. Five additional ENG credits are required from ENG 116 and above. Students must take an additional three credits in HIS, PSY, or SOS. (Total: 15 credits)

MATHEMATICS
The following courses are required: MAT 140, MAT 150 or MAT 180, MAT 200 or MAT 230, MAT 250, MAT 258, and two MAT electives numbered 200 or higher. (Total: 24 credits)

PHYSICS
The following courses are required: PHY 200 and PHY 250. (Total: 6 credits)

PROJECTS
The following courses are required: GAM 100, GAM 150, GAM 200, GAM 250, GAM 300, GAM 350, GAM 400, and GAM 450. (Total: 34 credits)

OPEN ELECTIVES
At least eight credits from any courses in any department at DigiPen. (Total: 8 credits)

NOTE ON GENERAL EDUCATION COURSES
The following courses satisfy the general education requirement for the Bachelor of Science in Computer Science in Real-Time Interactive Simulation: ART 210 (2), ART elective (2), COM 150 (3), ENG 110 (3), ENG electives numbered ENG 116 or higher (5), a social science elective in HIS, PSY, or SOS (3), MAT 150 or MAT 180 (4), MAT 250 (3), PHY 200 (3), and PHY 250 (3), for a total of 31 credits.

Recommended Course Sequence
for the Bachelor of Science in Real-Time Interactive Simulation

SEMESTER	COURSE	COURSE TITLE	CORE*	CREDITS
Semester 1	MAT 140	Linear Algebra and Geometry	X	4
	CS 100	Computer Environment	X	4
	CS 120	High-level Programming I: The C Programming Language	X	4
	GAM 100	Project Introduction	X	3
	ENG 110	Composition		3
	Semester Total			**18**
Semester 2	MAT 150 or MAT 180	Calculus and Analytic Geometry I or Vector Calculus I	X	4
	CS 170	High-level Programming II: The C++ Programming Language	X	4
	CS 230	Game Implementation Techniques	X	3
	GAM 150	Project I	X	3
	COM 150	Interpersonal and Work Communication		3
	Semester Total			**17**
Semester 3	MAT 200 or MAT 230	Calculus and Analytic Geometry II or Vector Calculus II	X	4
	CS 180	Operating System I: Man-Machine Interface	X	3
	CS 200	Computer Graphics I	X	3
	CS 225	Advanced C/C++	X	3
	GAM 200	Project II	X	4
	PHY 200	Motion Dynamics	X	3
	Semester Total			**20**

Note: Please see the previous page for an explanation of core courses.

SEMESTER	COURSE	COURSE TITLE	CORE*	CREDITS
Semester 4	PHY 250	Waves, Optics, and Aerodynamics		3
	CS 250	Computer Graphics II	X	3
	CS 365	Software Engineering	X	3
	CS 280	Data Structures	X	3
	GAM 250	Project II	X	4
	MAT 250	Linear Algebra	X	3
	Semester Total			**19**
Semester 5	CS 300	Advanced Computer Graphics I	X	3
	CS 260	Computer Networks I: Interprocess Communication	X	3
	CS 330	Algorithm Analysis	X	3
	MAT 258	Discrete Mathematics	X	3
	CG 130	3D Computer Animation Production I		3
	GAM 300	Project III	X	5
	Semester Total			**20**
Semester 6	MAT 300	Curves and Surfaces	X	3
	CS 350	Advanced Computer Graphics II	X	3
	CS 315	Low-level Programming	X	3
	Computer Science Elective	Any 200-level or higher CS course not required	X	3
	COL 499	Career Search Preparation: Materials, Logistics, and Communication	X	1
	GAM 350	Project III	X	5
	Open Elective	An elective of the student's choice from any department at DigiPen		3
	Semester Total			**21**
Semester 7	ART and MUS Elective	Select one: ANI 125, ART 105, FLM 115, FLM 151, FLM 152, or MUS 115		3
	English Elective	One English elective chosen from any ENG course, ENG 116 and above		3
	Computer Science Elective	Any 200-level or higher CS course not required	X	3
	Math Elective	MAT 256 or any MAT course greater than 300	X	3
	GAM 400	Project IV	X	5
	Open Elective	An elective of the student's choice from any department at DigiPen		3
	Semester Total			**20**
Semester 8	English Elective	One English elective chosen from any ENG course, ENG 116 and above		2
	Computer Science Elective	Any 200-level or higher CS course not required	X	3
	Computer Science or Physics Elective	Any 200-level or higher CS course not required	X	3
	GAM 450	Project IV	X	5
	Open Elective	An elective of the student's choice from any department at DigiPen		3
	HSS Elective	One humanities & social science elective from any three-credit HIS, PSY or SOS courses		3
	Semester Total			**19**
Degree Total				**154 minimum**

Bachelor of Science in Computer Science and Game Design

Program Overview

The field of digital entertainment has grown from using small teams of just a handful of developers for an entire game to using large teams of one hundred or more on a single title. This large increase in the size of teams, scope, and investment in digital entertainment titles has naturally resulted in more and more specialization into the roles of engineer, artist, and designer. Despite this increased specialization overall, the digital entertainment industry has also seen a growing demand for a hybrid engineer/designer: someone who has strong programming and mathematics skills, combined with formal training in game design. This type of developer is the bridge between the scientific and creative sides of game development, able to work as an engineer or designer as needed.

Graduates of this program will be trained to write computer programs in core languages such as C and C++, as well as the scripting languages commonly used by all designers. Graduates of this program will be well-versed in programming game logic, user interfaces, artificial intelligence, databases, and design tools. Graduates will also be well versed in game design theory for digital and non-digital games, level design, system design, and behavior design, with their strong foundation in programming and mathematics generally making them strong system and behavior designers. Graduates will have extensive experience testing, iterating, and polishing both digital and non-digital designs, through the completion of many individual projects and multiple team game projects.

Graduates of this degree program will be prepared to enter the video game industry as entry-level Software Engineers and Game Designers. Possible entry-level position titles include Software Engineer, Software Developer, Software Development Engineer, Software Development Engineer in Test, Software Analyst, Computer Programmer, Gameplay Programmer, Artificial Intelligence Programmer, User Interface Programmer, Tools Programmer, Game Scripter, Technical Designer, System Designer, Level Designer, Content Designer, Encounter Designer, and Game Designer. This degree program also includes secondary training that can contribute directly to a graduate obtaining positions with titles such as Producer, Program Manager, Technical Program Manager, and Technical Writer. After many years in the industry, graduates may obtain titles such as Lead Engineer, Lead Designer, Technical Director, Creative Director, and Director.

For details about graduation rates, median debt for students who complete this program, and other important information visit *digipen.edu/fileadmin/disclosures/BSGD.html*.

Degree Requirements

NUMBER OF CREDITS & GPA
The Bachelor of Science in Computer Science and Game Design requires completion of at least 154 semester credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of fifteen weeks each, or four academic years.

GRADE REQUIREMENTS AND CORE COURSES
Students must receive a grade of "C-" (or 1.7 quality points) or higher in all core courses for the Bachelor of Science in Computer Science and Game Design. (In a non-core course, a grade of "D" [or 1.0 quality points] is considered passing.) The core courses include all courses except open electives.

COMPUTER SCIENCE
The following courses are required: CS 100, CS 120, CS 170, CS 180, CS 225, CS 230, CS 251, CS 280, CS 311, CS 330, and CS 380. (Total: 36 credits)

MATHEMATICS
The following courses are required: MAT 140, MAT 150 or MAT 180, MAT 200 or MAT 230, MAT 258, and either MAT 340 or MAT 364. (Total: 18 credits)

PHYSICS
One course is required: PHY 200. (Total: 3 credits)

DESIGN
The following courses are required: GAT 110, GAT 120, GAT 210, GAT 211, GAT 240, GAT 250, GAT 251, GAT 315, and GAT 316. Three additional credits must be selected from other courses with the designation GAT that are numbered 200 or higher. (Total: 29 credits)

PROJECTS
The following courses are required: GAM 100, GAM 150, GAM 200, GAM 250, GAM 302, and GAM 352. Two courses from the following list are also required: GAM 375, GAM 390, GAM 400, GAM 450, and GAM 490. (Total: 34 credits)

HUMANITIES AND SOCIAL SCIENCE
The following courses are required: COL 499, COM 150, ENG 110, and PSY 101. Three additional credits must be selected from other courses with the designation COM, ENG, ECN, HIS, LAW, PHL, PSY, or SOS. (Total: 13 credits)

ART
The following courses are required: ART 105, ART 260, ART 310, CG 102 or CG 201, and CG 125 or CG 225. (Total: 15 credits)

OPEN ELECTIVES
At least six credits from any of the courses in any department at DigiPen. (Total: 6 credits)

NOTE ON GENERAL EDUCATION COURSES
The following courses satisfy the general education requirement for the BS in Computer Science and Game Design: COM 150 (3), ENG 110 (3), PSY 101 (3), MAT 140 (4), MAT 150 or MAT 180 (4), MAT 200 or MAT 230 (4), MAT 258 (3), PHY 200 (3), and one Humanities and Social Sciences elective (3), for a total of 30 credits.

Recommended Course Sequence
for the Bachelor of Science in Computer Science and Game Design

SEMESTER	COURSE	COURSE TITLE	CORE*	CREDITS
Semester 1	GAM 100	Project Introduction	X	3
	GAT 110	Game History	X	2
	GAT 120	Game Analysis	X	3
	CS 100	Computer Environment	X	4
	CS 120	High-Level Programming I: The C Programming Language	X	4
	MAT 140	Linear Algebra and Geometry	X	4
	Semester Total			**20**
Semester 2	GAM 150	Project I	X	3
	GAT 210	Game Mechanics I	X	3
	CS 170	High-Level Programming II: The C ++ Language	X	4
	CS 230	Game Implementation Techniques	X	3
	MAT 150	Calculus and Analytic Geometry I	X	4
	ENG 110	Composition	X	3
	Semester Total			**20**
Semester 3	GAM 200	Project II	X	4
	GAT 211	Game Mechanics II	X	3
	GAT 240	Technology for Designers	X	3
	CS 225	Advanced C/C++	X	3
	MAT 200	Calculus and Analytic Geometry II	X	4
	PHY 200	Motion Dynamics	X	3
	Semester Total			**20**
Semester 4	GAM 250	Project II	X	4
	GAT 250	2D Game Design I	X	3
	CS 180	Operating System I: Man-Machine Interface	X	3
	CS 280	Data Structures	X	3
	ART 105	Art Processes	X	3
	COM 150	Interpersonal and Work Communication	X	3
	Semester Total			**19**
Semester 5	GAM 302	Project III for Designers	X	5
	GAT 251	2D Game Design II	X	3
	CS 251	Introduction to Computer Graphics	X	3
	CS 380	Artificial Intelligence for Games	X	3
	ART 260	Graphic Design, User Experience, and Input	X	3
	PSY 101	Introduction to Psychology	X	3
	Semester Total			**20**

Note: Please see the previous page for an explanation of core courses.

SEMESTER	COURSE	COURSE TITLE	CORE*	CREDITS
Semester 6	GAM 352	Project III for Designers	X	5
	GAT 315	3D Game Design I	X	3
	MAT 258	Discrete Mathematics	X	3
	CG 102	2D Raster and Vector Graphics for Designers	X	3
	CG 125	Introduction to 3D Production for Designers	X	3
	ART 310	Architectural Spaces, Design, and Lighting I	X	3
	Semester Total			**20**
Semester 7	GAM 400	Project IV	X	5
	GAT 316	3D Game Design II	X	3
	CS 311	Introduction to Databases	X	3
	CS 330	Algorithm Analysis	X	3
	MAT 340 or MAT 364	Probability and Statistics or Combinatorial Game Theory	X	3
	Design Elective	Any three-credit course with the GAT designation	X	3
	Semester Total			**20**
Semester 8	GAM 450	Project IV	X	5
	COL 499	Career Search Preparation: Materials, Logistics, and Communication	X	1
	HSS Elective	Any three-credit COM, ENG, ECN, HIS, LAW, PHL, PSY, or SOS course.	X	3
	Open Elective	An elective of the student's choice from any department at DigiPen		3
	Open Elective	An elective of the student's choice from any department at DigiPen		3
	Semester Total			**15**
Degree Total				**154 minimum**

Bachelor of Fine Arts in Digital Art and Animation

Program Overview

As the digital entertainment and animation industries mature, there is a noticeable shift by companies to hire employees who demonstrate more than a working knowledge of a specific commercial software package or traditional artistic skills. Industry quality standards continue to rise, and competition for entry-level positions demands that artists possess sophisticated skill sets before they can even begin their careers. Studios seek artists with a broad and integrated foundation of theoretical, practical, and technical skills in production animation, traditional art, modern computer software, and media story flow. Insight and long term potential have become increasingly important. The studios also demand professional accountability and consistency.

A degree in digital art and animation opens the door to viable career opportunities for graduates who possess the knowledge, abilities, and talent. Animation is capable of solving informational, educational, and entertainment problems no other discipline can resolve. It provides a cornerstone for many industries including cinema, broadcast entertainment, cable television, software development, the Internet, education, simulation, product design, research, forensic science, architecture, telecommunications, advertising, travel and tourism, and video games. The fact that these industries depend upon qualified candidates accentuates the need for quality digital art and animation education.

The broad scope of these demands presents a series of significant academic challenges. Most art students enter collegiate training with little or no substantial background knowledge relative to this field. Many secondary schools have been forced to cut back on the level of arts training that they are able to provide. Consequently aspiring artists must acquire this foundation while they are also trying to establish their professional focus. The complexity of the individual components of this field demands a structured curriculum and programmed sequencing to enable students to be successful. Students benefit from the deep and sequential approach to the material that the program provides.

Students who successfully complete this curriculum will possess appropriate samples of professional work and the following:

- A broad foundation of traditional and digital art techniques and production experiences using different media in both 2D and 3D art and animation. This base allows students to gain an overview of the profession and provides long-term adaptability.

- An area of production emphasis and focus. This enables students to target a specific sector of the industry upon graduation. Each student will produce a portfolio to support this focus.

- Strong foundational skills in storytelling. This includes visual storytelling, literary traditions, story through dialog, story through acting, and cinematic conventions.

- Strong foundational skills in applied technology using industry-standard hardware and software. Students will be thoroughly familiar with modern interface and workflow conventions. They will also understand how to learn new software while maintaining a production schedule.

- A solid foundation in professional work habits and attitude. Students will understand how to utilize and integrate professional criticism into their work. Additionally, they will be able to identify and create work that meets professional quality standards. They will also understand production flow and be able to generate and maintain appropriate schedules and production goals for their work.

- Social perspective and civic accountability relative to the roles that animation plays in society. Students will explore the long-term ramifications of this industry and be able to intelligently discuss their responsibilities to the betterment of the animation industry and society as a whole.

The BFA in Digital Art and Animation prepares students for careers in digital art and digital 3D animation, digital 2D animation, and video game or animation pre-production. Possible job titles include Props and Environment Modeler, Texture Artist, Character Modeler, Character Rigger, Character Animator, 3D Lighting and Camera Designer, Effects Animator, Level Designer, UI Designer, Technical Artist, Producer, Project Manager, Compositor, Simulation and Effects Animator, Storyboard Artist, Maquette Sculptor, Web Designer, Art Instructor, Illustrator, Concept Artist, and Character Designer.

Degree Requirements

NUMBER OF CREDITS AND GPA

The Bachelor of Fine Arts in Digital Art and Animation requires completion of at least 145 credits with a cumulative GPA of 2.0 or better. Courses are either mandatory or elective and must in either case be passed with a final grade of "C-" (or 1.7 quality points) or higher. The program usually spans eight semesters of 15 weeks each, or four academic years.

GRADE REQUIREMENT AND CORE COURSES

Certain non-elective courses that are part of the DigiPen BFA in Digital Art and Animation course sequence are survey or introductory courses intended to widen the student's understanding and educational experience but are additional to, not central to the degree. These courses (SOS 115, PHY 115, CS 115, and LAW 115) are all 100 level courses, which are not taught during the first year of the degree program. As such, they are considered to be non-core classes and the grading protocols for non-core

courses apply (i.e., credit is given if the class is passed with a grade of "D" [or 1.0 quality points] or higher). All other courses, required or elective, are core courses and students must receive a grade of "C-" (or 1.7 quality points) or higher to pass.

ANIMATION
The following animation courses are required: ANI 101, ANI 125, and ANI 151. (Total: 9 credits)

ART
The following art courses are required: ART 101, ART 110, ART 115, ART 125, ART 151, ART 201, ART 251, ART 300, ART 350, ART 401, and ART 450. (Total: 34 credits)

COMPUTER GRAPHICS
The following computer graphics courses are required: CG 201, CG 225, CG 275, and CG 300. (Total: 12 credits)

ELECTIVES
Students must take a minimum of 24 credits from any DigiPen courses excluding the following: ART 102, ART 126, ART 210, ART 400, CG 102, CG 125, CG 130, CG 135. (Total: 24 credits)

FILM
The following film courses are required: FLM 115, FLM 151, and either FLM 201 or FLM 210. (Total: 9 credits)

HUMANITIES AND SOCIAL SCIENCE
The following courses are required: COL 499, LAW 115, SOS 115, ENG 116, and ENG 315. (Total: 15 credits)

MUSIC
The following course is required: MUS 115. (Total: 3 credits)

PROJECTS
The following projects courses are required: PRJ 201, PRJ 251, PRJ 300, PRJ 350, PRJ 400, and PRJ 450. Please note that INT 390 and INT 450, internship courses, may be taken in place of PRJ 400 and PRJ 450. (Total: 30 credits)

SCIENCE REQUIREMENTS
The following courses are required: CS 115, PHY 115, BIO 150, BIO 200. (Total: 12 credits)

NOTE ON GENERAL EDUCATION COURSES
The following courses satisfy the general education requirement for the BFA in Digital Art and Animation: ART 110 (3), ART 115 (4), ENG 116 (4), ENG 315 (4), FLM 115 (3), LAW 115 (3), SOS 115 (3), CS 115 (3), and PHY 115 (3), for a total of 30 credits.

Recommended Course Sequence for the Bachelor of Fine Arts in Digital Art and Animation

SEMESTER	COURSE	COURSE TITLE	CORE*	CREDITS
Semester 1	ANI 101	Introduction to Animation - Theories and Techniques I	X	3
	ART 101	The Language of Drawing	X	3
	ART 110	Fundamentals of Visual Communication and Design Process	X	3
	ART 115	Art and Technology	X	4
	ENG 116	Storytelling	X	4
	FLM 115	History of Film and Animation	X	3
	Semester Total			**20**
Semester 2	ANI 125	Acting for Animation	X	3
	ANI 151	Advanced Animation - Theories and Techniques II	X	3
	ART 125	Tone, Color, and Composition	X	3
	ART 151	Basic Life Drawing	X	3
	BIO 150	Human Muscular, Skeletal, and Kinetic Anatomy	X	3
	FLM 151	Visual Language and Film Analysis	X	3
	Semester Total			**18**

SEMESTER	COURSE	COURSE TITLE	CORE*	CREDITS
Semester 3	ART 201	Advanced Life Drawing	X	3
	BIO 200	Animal Muscular, Skeletal, and Kinetic Anatomy	X	3
	CG 201	2D Raster Graphics and Animation	X	3
	CG 225	Introduction to 3D Animation	X	3
	PRJ 201	2D Animation Production	X	5
	Semester Total			**17**
Semester 4	ART 251	Character Design	X	3
	ART 350	Storyboards	X	3
	CG 251 or Elective	2D Vector Animation Production or **any course from the Elective Requirements list	X	3
	CG 275	3D Character Animation	X	3
	FLM 201 or FLM 210	Cinematography or Cinematography for Visual Effects	X	3
	PRJ 251	2D Vector Animation	X	5
	Semester Total			**20**
Semester 5	ANI 300 or Elective	Acting through an Interface or **any course from the Elective Requirements list	X	3
	ART 300	Perspectives, Backgrounds, and Layouts	X	3
	CG 300	3D Environment and Level Design	X	3
	ENG 315	Story Through Dialogue	X	4
	PRJ 300	Limited-Scope 3D Production	X	5
	Semester Total			**18**
Semester 6	ANI 350 or Elective	Voice Acting for Animation or **any course from the Elective Requirements list	X	3
	ART 225 or Elective	3D Design and Sculpture or **any course from the Elective Requirements list	X	3
	COL 499	Career Search Preparation: Materials, Logistics, and Communication	X	1
	CS 115	Introduction to Scripting and Programming		3
	PHY 115	Introduction to Applied Math and Physics		3
	PRJ 350	3D Animation Production	X	5
	Semester Total			**17**
Semester 7	ART 401	Conceptual Illustration and Visual Development	X	3
	ART 450	Portfolio	X	3
	FLM 250 or Elective	Digital Post-Production or **any course from the Elective Requirements list	X	3
	MUS 115 or Elective	Fundamentals of Music and Sound Design or **any course from the Elective Requirements list	X	3
	PRJ 400	Capstone Project I	X	5
	Semester Total			**17**
Semester 8	ANI 400 or Elective	Cinematic Animation or **any course from the Elective Requirements list	X	3
	CG 350 or Elective	Graphics for Gaming or **any course from the Elective Requirements list	X	3
	LAW 115	Introduction to Intellectual Property and Contracts		3
	PRJ 450	Capstone Project II	X	5
	SOS 115	Media and Ethics: A Social Science Perspective		3
	Semester Total			**17**
Degree Total				**145 minimum**

Note: Please see the previous page for an explanation of core courses.

Minors

ART MINOR

To earn an Art Minor at DigiPen, students must complete a block of 18 credits satisfying the following:

- 3 credits from ART 101 or ART 102

- And 3 credits from ART 125 or ART 126

And 12 additional credits from the following:

- ART 110, ART 115, ART 111, ART 151, ART 201, ART 222, ART 223, ART 226, ART 230. ART 228, ART 251, ART 260, ART 300, ART 310, ART 350
- CG 125 or CG 130,
- CG 201, or CG 102
- CG 225, CG 251, CG 275
- FLM 115, FLM 151, FLM 201
- ANI 101, ANI 151

All credits must be earned with a grade of "C-" (or 1.7 quality points) or better.

GAME DESIGN MINOR

To earn a game design minor at DigiPen, students must complete a block of 17 credits or more from the following courses: GAT 110, GAT 120, GAT 210, GAT 211, GAT 212, GAT 250, GAT 251, GAT 305, GAT 310, GAT 315, GAT 316, GAT 330, GAT 335, GAT 405. At least 9 of these credits must be earned at DigiPen. All credits must be earned with a grade of "C-" (or 1.7 quality points) or better.

MATH MINOR

To earn a math minor at DigiPen, a student must complete a block of 27 credits satisfying the following:

- The courses are taken from MAT 140 or higher.
- PHY 300 may substitute for one of the MAT courses.
- Six credits must be numbered 300 or higher.
- At least nine credits in this subject area must be taken at DigiPen.
- All credits must be earned with a grade of "C-" (or 1.7 quality points) or higher.

Courses for the Academic Year 2015-2016

Department of Animation and Production

PROJECTS COURSES

PRJ 450 **Senior Cinematic Project II** (5 cr.)
Prerequisite(s): PRJ 400

With the completed pre-production work for a cinematic project done, students are then guided through final rendering and post-production. Students are assisted through the challenges of commercial art direction, quality control, production deadlines, and team dynamics, as well as many technical challenges.

Department of Computer Science

COMPUTER SCIENCE COURSES

CS 120 **High-Level Programming I: The C Programming Language** (4 cr.)
Prerequisite(s): None

This course serves as a foundation for all high-level programming courses and projects by introducing control flow through statement grouping, decision making, case selection, and procedure iteration as well as basic data types. Additionally, this course addresses the lexical convention, syntax notation, and semantics of the C programming language.

CS 170 **High-Level Programming II: The C++ Programming Language** (4 cr.)
Prerequisite(s): CS 120

This course introduces the C++ language with particular emphasis on its object-oriented features. Topics include stylistic and usage differences between C and C++, namespaces, function and operator overloading, classes, inheritance, templates, and fundamental STL components.

CS 180 **Operating Systems I: Man-Machine Interface** (3 cr.)
Prerequisite(s): CS 100 or CS 101, CS 170

This course presents an overview of modern operating systems as implemented on personal computers. It presents an overview of what an operating system is and does, with emphasis on the following topics: organization and design, process management, threading, interprocess communication, process synchronization, and memory management.

Department of Fine Arts

ART COURSES

ART 251 **Character Design** (3 cr.)
Prerequisite(s): ART 201, CG 201

This course introduces the traditions of character design and the basic structural strategies for creating animated characters. The course explores simplification gradients relative to human, animal, and inanimate object-based characters. It also considers issues of costume, personality, and story interaction. The course emphasizes professional applications, techniques, and standards of quality. The work completed in this course may serve as pre-production design for PRJ 300, PRJ 350, or ANI 300.

ART 228 **Figurative Sculpture** (3 cr.)
Prerequisite(s): ART 151, BIO 150

This course introduces the challenges of sculpting the human figure from life. It utilizes traditional techniques to build an armature and complete a sculpture in clay for the purpose of exploring the human form in 3D space. Emphasis is placed on gesture, proportion, and anatomy, as well as on developing a strong sense of form and volume.

Department of Humanities and Social Sciences

ENGLISH COURSES

ENG 243 **Epic Literature** (3 cr.)
Prerequisite(s): ENG 110 or ENG 116, ENG 150

This course provides an introduction to the epic as a genre, including poetry, drama, and novels. Particular attention is paid to the theme of heroism and its many cultural manifestations.

PSYCHOLOGY COURSES

PSY 201 **Cognitive Psychology** (3 cr.)
Prerequisite(s): PSY 101

This course emphasizes emergent research on the theory and dynamics of consciousness and the cognitive unconscious. Students are exposed to recent research that has led to an unprecedented understanding of higher human cognitive processes such as creativity, learning, perception, information processing, and memory.

Department of Game Software Design and Production

GAME PROJECTS COURSES

GAM 250 **Project II** (4 cr.)
Prerequisite(s): CS 225, GAM 200
Credit may be received for GAM 250 or for GAM 255, but not both.

In this class, students work to complete and polish the projects they began in GAM 200. Additional topics may include intermediate software architecture, advanced debugging techniques, bug tracking, formal playtesting, game pacing, and game balance.

GAM 302 **Project III for Designers** (5 cr.)
Prerequisite(s): CS 280 or CS 176, GAM 250 or GAM 255, PHY 115 or PHY 200, GAT 250
Credit may be received for either GAM 300 or GAM 302, not both.

This project is divided into two semesters and focuses on the design of an advanced real-time game or simulation. Students work in teams either made up only of designers or with students from GAM 300. Designer-only teams can use commercial game engines, middleware, or other libraries that teams with GAM 300 students cannot. Additional topics may include online portfolios, effective presentations, managing scope, and advanced team dynamics.

Department of Mathematics

MATHEMATICS COURSES

MAT 320 **Mathematics of Digital Signal Processing I** (3 cr.)
Prerequisite(s): MAT 200

This course explores the mathematical foundations of digital signal processing, with applications to digital audio programming. Topics include: digital signals, sampling and quantization, complex numbers and phasors, complex functions, feedforward filters, feedback filters, frequency response and transfer functions, periodic signals and Fourier series, discrete Fourier transform and fast Fourier transform, comb and string filters, Z-transform and convolution.

MAT 321 **Mathematics of Digital Signal Processing II** (3 cr.)
Prerequisite(s): MAT 320

This course continues to explore the mathematical foundations of digital signal processing, with applications to digital audio programming. Topics include: Review of digital signals, Z-transforms and convolution, filter types, applications of fast Fourier transform, switching signals on and off, windowing, spectrograms, aliasing, digital to analog conversion, Nyquist Theorem, filter design, Butterworth filters, reverb, and the phase vocoder.