



COURSE CATALOG ADDENDUM

2013–2014

Updated: July 23, 2013

Notices

Authorization

[Updated: November 2012]

In accordance with the Degree-Granting Institutions Act Regulations (WAC 250-61-060 (3)), DigiPen Institute of Technology is considered to be an eligible institution exempted from degree authorization requirements by the Washington Student Achievement Council effective November 1, 2012.

Rules and Policies for the Academic Year 2013–2014

General Information

DEGREE AUTHORIZATION

[Updated: November 2012]

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ACCREDITATION

[Updated: March 2013]

DigiPen Institute of Technology is accredited by the Accrediting Commission of Career Schools and Colleges (“ACCSC”, or “the Commission”), a recognized accrediting agency by the United States Department of Education.

Important dates in DigiPen’s accreditation history are as follows:

- 2002: DigiPen was granted initial accreditation by ACCSC, including the approval for the Bachelor of Science in Real-Time Interactive Simulation degree program.
- 2002: DigiPen received ACCSC approval for the Bachelor of Fine Arts in Production Animation (BFA) degree program.
- 2003: DigiPen received ACCSC approval for the Bachelor of Science in Computer Engineering degree program.
- 2005: DigiPen was granted a renewal of accreditation by ACCSC.
- 2006: DigiPen was granted approval for its Master of Science in Computer Science degree program by ACCSC.
- 2008: DigiPen was granted approval for its Bachelor of Arts in Game Design and Bachelor of Science in Game Design degree programs by ACCSC.
- 2010: DigiPen was granted approval for its relocation to its current facility by ACCSC.
- 2010: DigiPen received ACCSC approval which allows DigiPen Institute of Technology Singapore to disclose in its advertising that it is a branch campus of DigiPen Institute of Technology.
- 2010: DigiPen was granted approval to change the program name from the Bachelor of Fine Arts in Production Animation to the Bachelor of Fine Arts in Digital Art and Animation.
- 2011: DigiPen was granted approval to change the program name from the Bachelor of Science in Real-Time Interactive Simulation to the Bachelor of Science in Computer Science in Real-Time Interactive Simulation.
- 2011: DigiPen Institute of Technology Singapore was granted accreditation by ACCSC as a branch campus of the main school located in Redmond, Washington, USA.
- 2011: DigiPen was granted approval for its Master of Fine Arts in Digital Arts degree program by ACCSC.

- 2012: DigiPen was granted approval for its Bachelor of Arts in Music and Sound Design and Bachelor of Science in Engineering and Sound Design degree programs by the ACCSC.
- 2012: DigiPen was granted approval to change the program name from the Bachelor of Science in Game Design to the Bachelor of Science in Computer Science and Game Design.

Any person desiring information about the accreditation requirements or the applicability of these requirements to the Institute may contact the ACCSC by mail at 2101 Wilson Boulevard, Suite 302, Arlington, VA 22201, or by phone at (703) 247-4212. ACCSC’s website address is www.accsc.org.

HISTORY OF DIGIPEN INSTITUTE OF TECHNOLOGY

[Updated: February 2013]

DigiPen was founded in 1988 by Mr. Claude Comair as a computer simulation and animation company based in Vancouver, British Columbia, Canada. As the demand for production work increased, DigiPen faced difficulty finding qualified personnel, and in 1990, it began offering a dedicated training program in 3D computer animation to meet this growing need.

That same year, DigiPen approached Nintendo of America to jointly establish a post-secondary program in video game programming. The result of this collaborative effort was the DigiPen Applied Computer Graphics School, which in 1994, officially accepted its first class of video game programming students to its Vancouver campus for the two-year Diploma in the Art and Science of 2D and 3D Video Game Programming. In 1995, DigiPen implemented a revised two-year 3D computer animation program and graduated student cohorts over each of the following four years.

Around this time, the video game industry underwent a paradigm shift from dealing primarily with 2D graphics and gameplay to full 3D worlds that players could freely explore. As these worlds became more sophisticated, so did the task of programming, designing, and animating them. In anticipation of this change, DigiPen developed a four-year bachelor’s degree in video game programming (the Bachelor of Science in Computer Science in Real-Time Interactive Simulation) that would prepare students for the challenges of creating complex 3D game and simulation software.

In 1996, the Washington State Higher Education Coordinating Board (HECB) granted DigiPen the authorization to award both Associate and Bachelor of Science degrees in Real-Time Interactive Simulation. Two years later, in 1998, DigiPen Institute of Technology opened its campus in Redmond, Washington, USA. In 1999, DigiPen began offering the Associate of Applied

Arts in 3D Computer Animation. At this time, DigiPen phased out its educational activities in Canada, moving all operations to its Redmond campus. On July 22, 2000, DigiPen held its first commencement ceremony, where it awarded Associate of Science and Bachelor of Science degrees.

In 2002, DigiPen received accreditation from the Accrediting Commission of Career Schools and Colleges (ACCSC). In 2004, DigiPen began offering three new degrees: the Bachelor of Science in Computer Engineering, the Master of Science in

Computer Science*, and the Bachelor of Fine Arts in Digital Art and Animation. In 2008, DigiPen added two more degree programs: the Bachelor of Science in Computer Science and Game Design and the Bachelor of Arts in Game Design.

Also in 2008, DigiPen partnered with Singapore's Economic Development Board to open its first international branch campus*, offering the following degrees: the Bachelor of Science in Computer Science in Real-Time Interactive Simulation, the Bachelor of Science in Computer Science and Game Design, the Bachelor of Fine Arts in Digital Art and Animation, and the Bachelor of Arts in Game Design. In 2010, DigiPen announced plans to open its first European campus in Bilbao, Spain**.

That same year, DigiPen relocated its US campus to its current location at 9931 Willows Road Northeast in Redmond, Washington. In addition to uniting DigiPen's BFA and BS programs under one roof, the larger campus provides more spaces for students to learn, meet, and collaborate on group projects.

On September 26, 2011, DigiPen launched DigiPen Institute of Technology Europe – Bilbao offering two bachelor's degree programs: Bachelor of Science in Computer Science in Real-Time Interactive Simulation and Bachelor of Fine Arts degree in Digital Art and Animation, to forty students.

On October 11, 2011, DigiPen Institute of Technology Singapore*** was granted accreditation by ACCSC as a branch campus of the main school located in Redmond, Washington, USA.

In 2012, DigiPen added three new degree programs: the Bachelor of Arts in Music and Sound Design, the Bachelor of Science in Engineering and Sound Design, and the Master of Fine Arts in Digital Arts.

**DigiPen began offering the MSCS program in 2004 before ACCSC expanded its scope of recognition by the United States Department of Education to grant approval for master's degree programs. ACCSC granted approval for this degree in 2006.*

*** DigiPen's Europe-Bilbao campus does not fall within the scope of ACCSC accreditation.*

****DigiPen's Singapore campus falls within the scope of ACCSC accreditation.*

DESCRIPTION OF THE LIBRARY FACILITIES AND INTERNET ACCESS LIBRARY SERVICES

[Updated: July 2013]

DigiPen's library aims to support the Institute's curriculum, students, faculty, and staff. Students have access to a variety of resources such as books, games, e-books, DVDs***, sound effects and reference books relevant to their program of study. The library also subscribes to a selection of major journals and magazines related to the fields of gaming, simulation, computer engineering, and animation. Furthermore, the DigiPen library allocates an annual budget for updating the contents of the library. The 1,100 square-foot library currently holds over 5,000 books, over 6,600 e-books, videos, and subscriptions to 30 different magazines (print and electronic), with access to many more available in our online databases. The library also loans out video games, consoles, and other equipment. The librarian provides reference services, information literacy instruction, and materials through inter-library loan. In addition to these curriculum-related resources, the library has a collection of career-oriented materials, including books on resumes, cover letters, and interviews.

The library facilities provide a quiet place to study and areas for small groups to meet and work collaboratively. Library hours change from term to term. For current hours, please refer to the library's webpage or contact the library staff by email at library@digipen.edu or by phone at (425) 895-4420.

PROGRAMS OF STUDY OFFERED

[Updated: February 2013]

Currently, the Institute offers the following degree programs:

- Bachelor of Science in Computer Science in Real-Time Interactive Simulation
- Bachelor of Science in Computer Science and Game Design
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Engineering and Sound Design
- Bachelor of Fine Arts in Digital Art and Animation
- Bachelor of Arts in Game Design
- Bachelor of Arts in Music and Sound Design
- Master of Science in Computer Science
- Master of Fine Arts in Digital Arts

Important Dates

INSTITUTIONAL CALENDAR

[Updated: July 2013]

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- **August 27–29, 2013**
Orientation—First Year Students
 - **September 2, 2013**
Labor Day
No Classes—Labs Closed
 - **September 3, 2013**
Classes Begin—Fall Semester
 - **November 11, 2013**
Veterans' Day
No Classes—Labs Open
 - **November 28–29, 2013**
Thanksgiving
No Classes—Labs Open
 - **December 9–13, 2013**
Fall Semester Final Exams
 - **December 13, 2013**
Fall Semester Ends
 - **December 14, 2013–January 6, 2014**
Winter Break
No Classes—Labs Closed
 - **January 2–5, 2014**
Intersession
No Classes—Labs Closed
 - **January 6, 2014**
Classes Begin—Spring Semester
 - **January 20, 2014**
M.L. King Jr. Day
No Classes—Labs Closed
 - **February 3, 2014**
Founder's Day
No Classes—Labs Open
 - **February 17, 2014**
Presidents' Day
No Classes—Labs Open
 - **March 17–21, 2014**
Spring Break
No Classes—Labs Open
 - **April 21–25, 2014**
Spring Semester Final Exams
 - **April 25, 2014**
Spring Semester Ends
 - **April 26–May 2, 2014**
Intersession
No Classes—Labs Closed
 - **April 27, 2014**
Commencement
 - **May 5, 2014**
Classes Begin—Summer Session
 - **May 26, 2014**
Memorial Day
No Classes—Labs Closed
 - **July 4, 2014**
Independence Day
No Classes—Labs Closed
 - **July 21–25, 2014**
Summer Session Final Exams
 - **July 25, 2014**
Summer Session Ends
 - **August 28–29, 2014**
Orientation – First year Students
 - **September 1, 2014**
Labor Day
No Classes—Labs Closed
 - **September 2, 2014**
Classes Begin – Fall Semester
 - **November 11, 2014**
Veterans' Day
No Classes
 - **November 27–28, 2014**
Thanksgiving
No Classes
 - **December 8–12, 2014**
Fall Semester Final Exams
 - **December 12, 2014**
Fall Semester Ends

The Institute is closed on all statutory holidays. 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. It is usually the last two working days of the month unless otherwise posted. Enrollment occurs once a year, in September.

DEADLINES

[Updated: July 2013]

- **July 1, 2013**
Tuition deposit due for Fall 2013 semester
- **July 8, 2013**
Last day to submit Request for Change of Major for Fall 2013 Semester

Last day to submit Application for Readmission for Fall 2013 Semester
- **August 1, 2013**
Tuition balance due for Fall 2013 Semester
- **September 9, 2013**
Last day to drop Fall 2012 Semester courses for 100% refund

Last day to add classes for Fall 2012 Semester
- **September 16, 2013**
Final day to drop classes without academic penalty
- **October 2, 2013**
Withdrawal deadline for 50% refund
- **October 28, 2013**
Final day to receive a “W” on transcript for Fall 2013 Semester withdrawals.

Withdrawals from the Institute after this date will receive “F” grades on transcript

Final day to drop a class
- **November 1, 2013**
Tuition deposit due for Spring 2014 Semester
- **November 25, 2013**
Last day to submit Request for Change of Major for Spring 2014 Semester

Last day to submit Application for Readmission for Spring 2014 Semester
- **December 1, 2013**
Tuition balance due for Spring 2014
- **January 12, 2014**
Last day to drop Spring 2014 Semester courses for 100% refund

Last day to add classes for Spring 2014 Semester
- **January 19, 2014**
Final day to drop classes without academic penalty
- **February 4, 2014**
Withdrawal deadline for 50% refund
- **March 2, 2014**
Final day to receive a “W” on transcript for Spring 2014 Semester withdrawals.

Withdrawals from the institute after this date will receive “F” grades on transcript

Final day to drop a class
- **April 1, 2014**
Tuition Balance due for Summer 2014 session
- **April 7, 2014**
Last date to submit Request for Change of Major for Summer 2014 session

Last day to submit Application for Readmission for Summer 2014 session
- **May 11, 2014**
Last day to drop Summer 2014 Session courses for 100% refund

Last day to add classes for Summer 2014 Session

Automatic Withdrawal date from classes missing pre-requisites
- **May 18, 2014**
Final day to drop classes without academic penalty
- **June 3, 2014**
Last day to receive 50% Summer 2014 tuition refund
- **June 29, 2014**
Final day to receive a “W” on transcript for Summer 2014 Session withdrawals.

Withdrawals from the Institute after this date will receive “F” grades on transcript

Final day to drop a class
- **July 1, 2014**
Tuition deposit due for Fall 2014 semester
- **July 7, 2014**
Last day to submit Request for Change of Major for Fall 2014 Semester

Last day to submit Application for Readmission for Fall 2014 Semester
- **August 1, 2014**
Tuition balance due for Fall 2014 Semester
- **September 8, 2014**
Last day to drop Fall 2014 Semester courses for 100% refund.

Last day to add classes for Fall 2014 Semester
- **September 15, 2014**
Final day to drop class without academic penalty
- **October 1, 2014**
Withdrawal deadline for 50% refund
- **October 27, 2014**
Final day to receive a “W” on transcript for Fall 2014 Semester withdrawals

Withdrawals from the Institute after this date will receive “F” grades on transcript

Tuition and Fees

BOOKS & SUPPLIES

[Updated: July 2013]

Estimated cost for textbooks and supplies is \$1,026 per year.

This cost is not included as a part of the tuition.

Financial Assistance

Financial Assistance

DIRECT SUBSIDIZED STAFFORD LOANS

[Updated: July 2013]

Direct Stafford Subsidized loans are awarded to undergraduate students based on financial need. To be eligible for this loan, you must be enrolled as at least a half-time student. With Direct Stafford Subsidized loans, the federal government pays for the interest accrued while you are in school. Interest accrues once you graduate, leave school, or enroll as less than a half-time student.

Applying to DigiPen

UNDERGRADUATE APPLICATION PROCESS

[Updated: July 2013]

6. Official SAT or ACT exam scores: DigiPen requires completion of the SAT or ACT test and submission of these scores from all undergraduate applicants who have attended high school in the U.S. International applicants are strongly encouraged to submit SAT scores, but they are not mandatory. Applicants to DigiPen's undergraduate degree programs do not need to submit scores if they have already graduated from high school and have at least one full-time year (or 24 semester credits, 45 quarter credits) of college experience or if they graduated from high school more than ten years ago. Applicants with college-level equivalent credits earned during military service should contact the Office of Admissions for waiver confirmation. Any applicant coming directly from high school will need to submit SAT/ACT scores regardless of whether or not he or she has taken some college courses. There is no minimum score requirement for either test. SAT or ACT test scores must be sent directly to DigiPen by the issuing organization. DigiPen also accepts them on official high school transcripts. SAT code: 4138; ACT code: 6659.

GRADUATE APPLICATION PROCESS

Admissions Requirements for Master of Science in Computer Science

3. Official Graduate Record Examination (GRE) scores for the General Test: All graduate applicants must complete the GRE General Test and arrange for the testing agency to send those scores directly to DigiPen Institute of Technology. GRE code: 4193. Students applying to the Master's Program in Computer Science should note that the preferred combined GRE verbal and math scores should be in the 60th percentile or better. Applicants to the Master's Program in Computer Science with an undergraduate degree in any major other than Computer

Science or Computer Engineering are required to take an additional test: the Computer Science GRE Subject Test or the DigiPen Computer Science Exam. An acceptable score for the Computer Science GRE Subject Test is 700 or higher. A score of 70% is the minimum acceptable score for the DigiPen Computer Science Exam. Please note that achieving an acceptable score on the Computer Science GRE Subject Test or the DigiPen Computer Science Exam does not guarantee admission. For more information on the DigiPen Computer Science Exam, please email admissions@digipen.edu to be directed to the testing services coordinator.

Waiver Credit, AP Examinations, CLEP, and Other Credit

[Updated: July 2013]

Students may apply for course waivers if they can demonstrate that their knowledge and skills - whether they were gained by formal education, exam, work experience, or life experience - are equivalent to those gained by courses offered at DigiPen Institute of Technology. Credit may be granted through other means: Advanced Placement (AP) Exam scores, International Baccalaureate (IB) courses, College-Level Examination Program (CLEP) subject exam scores, or transfer credits from other post-secondary institutions. A maximum of nine credits per semester may be earned by these means. Course transfers and waivers are processed at \$25.00 per credit.

TRANSFER CREDIT

[Updated: July 2013]

Credit earned by examination at other colleges or universities in the last ten years may be transferred, provided such credit meets the guidelines used by DigiPen Institute of Technology. For undergraduate programs, a student must take a minimum of 50% of the entire program at DigiPen. Graduate programs allow a maximum of 15 transfer credits from other colleges and other DigiPen programs.

The Registrar will evaluate college credits earned elsewhere with respect to graduation requirements at DigiPen. Developmental classes, orientation classes, or classes in which a student receives a "Pass" are not eligible for transfer credit consideration. Courses transferred or waived are entered on transcripts, but no grades or quality points are awarded.

Transfer credit may be accepted subject to the following conditions and restrictions:

1. The course(s) offered for transfer must be taken at an accredited institution, and these courses must appear on official transcripts from the institution.
2. The course(s) must be comparable in academic quality to DigiPen courses; transfer credit will be denied for courses not meeting this standard. Accordingly, current students are strongly urged to seek transfer approval from their advisor and the Registrar using the form provided for this purpose prior to enrollment in any course for which transfer approval might be sought.
3. Transfer credit will be considered for courses in which the grade of "B-" or better is recorded.

4. Courses transferred to a student's major may also require a validation examination in order to be accepted.
5. "Credit" or "Pass" grades will not be accepted for transfer.

If a course is accepted for credit, it will be counted as a transfer credit. No grade points from such transfer courses will be calculated in the DigiPen grade point average. However, grades transferred for courses taken in residence at institutions with which DigiPen has direct, formal institutional exchange agreements are exempt from this policy and will be recorded. Courses transferred in may not be used to substitute improved grades for passing grades earned at DigiPen.

INTERCAMPUS TRANSFER POLICY

[New: July 2013]

Intercampus Transfers are students who have enrolled in a DigiPen degree program and wish to permanently transfer to another DigiPen campus. Students who intend to complete an intercampus transfer should submit a completed Application for Campus Transfer to the Office of Admissions for the campus to which they wish to transfer.

Before applying for intercampus transfer, it is important for students to be made aware of the following conditions:

1. Students should complete a minimum of twenty-five percent (25%) of the credits required for the undergraduate degree program at the DigiPen campus awarding the degree;
2. At a minimum, students must maintain matriculated status for at least one academic year and complete the final semester at the campus awarding the degree.

Students may contact the Office of the Registrar at their current campus for more information on transfer requirements, deadlines, and any other special procedures.

Standards of Progress

SEMESTER CREDIT HOUR

[Updated: July 2013]

The semester credit hour is the basic unit of credit awarded at the Institute. The academic value of each course is stated in semester credits. DigiPen defines a semester credit hour as follows:

Over any semester, one semester credit hour of academic credit equals:

- at least 15 hours of classroom contact, or
- at least 22.5 hours of supervised laboratory time, ***or
- at least 45 hours of internship or externship experience.

In addition, each semester credit also assumes:

- a minimum of 30 hours over the semester for external preparation, project work, or homework by the student, except for independent studies or internship or externship experience.

A classroom contact hour is 53 minutes in length.

Whenever "semester hour" is used in this Catalog, it is synonymous with "semester credit hour" (SCH) and does not always represent "hours per week in class." Students taking courses over the summer should be aware that the total number of hours for a course is compressed into the 11 weeks, but is not reduced. The number of courses that a student is recommended to take during the shorter Summer semester is therefore fewer than the Fall or Spring semesters.

SATISFACTORY PROGRESS

[Updated: July 2013]

Federal Regulations mandate that Institutions of Higher Education create a Satisfactory Academic Progress (SAP) standard for students receiving financial assistance under the Title IV programs. The point of SAP standards are to measure a student's progress toward the completion of their education program. The Financial Aid Office is responsible for ensuring that all students receiving federal Financial Aid are meeting these standards by conducting an evaluation at the end of each term.

The SAP standards established in this policy apply to all Title IV Financial Aid programs administered by the Institution. This includes Unsubsidized loans, Subsidized loans, PLUS loans, Grad PLUS loans, and Federal Pell Grant.

The Institute's SAP policy is the same for all students, regardless of whether they are receiving federal financial aid or not. To be eligible for any of the types of Financial Aid listed above, a student must be:

1. Matriculated
2. Meeting the terms of the SAP policy

The SAP policy is comprised of two standards: qualitative and quantitative. The qualitative standard measures academic performance by the cumulative grade point average. The quantitative standard measures the total number of academic credits earned within the specified time periods and satisfactory pace towards completion. Financial Aid recipients must meet all of these standards to qualify for aid.

A program of study must be completed within a reasonable period of time for a student to be eligible for graduation; that is, the credit hours attempted cannot exceed 1.5 times the credit hours required to complete the program. For example, the BFA program normally takes 145 credits to complete. Students in this program have up to 217.5 credits to complete their program. The Registrar will withdraw students from the Institute who do not meet this requirement.

In addition, frequent withdrawals from courses or from the Institution, failed or repeated courses, changes of major, or taking courses that are not related to the student's degree program could put the student's financial aid eligibility at risk. All attempted hours at the Institution and accepted transfer credits will count toward the maximum time frame for SAP. Students who have completed sufficient hours to finish their degree program are no longer eligible for financial aid. For financial aid recipients, if it is determined that a student will not be able to complete their degree within the maximum allowable time frame, eligibility for student financial aid may be revoked.

ACADEMIC WARNING

Failing to Meet Minimum GPA Requirement

[Updated: July 2013]

Students who fail to maintain the required minimum cumulative Grade Point Average (GPA) will be placed on Academic Warning the semester following the one where their cumulative GPA falls below the minimum required GPA. Students are removed from Academic Warning as soon as their cumulative GPA is above the minimum required GPA. Students who earn a 2.0 during the semester while they are placed on Academic Warning but do not raise their cumulative GPA above the minimum requirement will continue on Academic Warning until their cumulative average meets the minimum requirement. While on Academic Warning, students may be restricted to a maximum course load of 15 credits of which 50% must be core courses as defined in the course catalog. These students must achieve a GPA of 2.0 or higher during the semester while on Academic Warning. Failure to satisfy these requirements will result in academic expulsion, and expelled students must wait 12 months before they can reapply for admission.

For financial aid recipients, please also refer to the Financial Aid section of the catalog for information regarding the SAP policy for financial aid.

Student Affairs

ACADEMIC SUPPORT CENTER

[Updated: June 2013]

Peer tutoring is available for 100 and 200 level courses and upper-division computer graphics courses in the Academic Support Center. For further information please contact tutors@digipen.edu.

Instructors for all courses are also available outside of normal class hours to answer questions and provide additional academic assistance as needed to students.

Degree Programs for the Academic Year 2013–14

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

PROGRAM OVERVIEW

[Updated: July 2013]

The electronic and digital entertainment industry 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 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 program is a computer science degree that is highly focused on the technical area of graphics and simulations. Participants in the BS in Computer Science in Real-Time Interactive Simulation program specialize in the skills and tools necessary to create real-time simulations of real-life events and imaginary situations.

The BS in Computer Science in Real-Time Interactive Simulation 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 team-based 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 Real-Time 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 game design, production, and programming. 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 simulations 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 many 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 designer, and technical writer.

Students in the BS in Computer Science in Real-Time Interactive Simulation program who are interested in pursuing a graduate degree at DigiPen or taking graduate level coursework during their undergraduate studies, may participate in the "Accelerated Schedule" option, which permits students who meet the minimum requirements to take selected graduate-level courses during the junior and senior years of their undergraduate study and apply up to 15 credits towards both BS and MS degree requirements. Students who pursue the accelerated schedule can successfully complete their BS in Computer Science in Real-Time Interactive Simulation degree and Master of Science in Computer Science in five years sequentially. Please refer to the section about the "Accelerated Schedule" for more details. Rather than attempt to provide a broad, general education, this degree program is an intensive educational experience in a specialized and highly technical area, and it prepares students for a career in several rapidly expanding industries. Staff and faculty are prepared to guide students desiring more general education course work about supplementary opportunities available through other institutions.

DEGREE REQUIREMENTS

[Updated: July 2013]

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

Art Requirements

Students are required to take ART 210, CG 130 and 2 additional credits from the following: ANI 125, ART 400, FLM 115, FLM 151, FLM 152, FLM 275, or ART 410. (Total: 7 credits)

Computer Science Requirements

The following courses are required: CS 100, CS 100L, CS 120, CS 120L, CS 170, CS 170L, 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 or PHY 350. (Total: 60 credits)

Humanities and Social Sciences Requirements

Required courses are COL 101, 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 Requirements

The following courses are required: MAT 140, MAT 150 or MAT 180, MAT 200 or MAT 230, MAT 250, MAT 258, MAT 300, and one MAT elective numbered higher than 300, or MAT 256. (Total: 24 credits)

Physics Requirements

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

Projects Requirements

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)

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 CHART

[Updated: March 2013]

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	MAT 140	Linear Algebra and Geometry	X	4
	CS 100	Computer Environment	X	3
	CS 100L	Computer Environment Lab	X	1
	CS 120	High-Level Programming I—The C Programming Language	X	3
	CS 120L	High-Level Programming I Lab	X	1
	GAM 100	Project Introduction	X	3
	ENG 110	Composition		3
	COL 101	College Life and Academic Skills		1
	Semester Total			
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	3
	CS 170L	High-Level Programming II Lab	X	1
	CS 230	Game Implementation Techniques	X	3
	GAM 150	Project I	X	3
	COM 150	Interpersonal and Work Communication		3
	Semester Total			
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			
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			

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
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			
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 or Physics Elective	Any 200-level or higher CS course not required or PHY 350	X	3
	GAM 350	Project III	X	5
	Elective	An elective of the student's choice from any department at DigiPen		3
	Semester Total			
Semester 7	Art Elective	Select one: ANI 125, ART 400, FLM 115, FLM 151, FLM 152, FLM 275, or ART 410		2–3
	English Elective	One English elective chosen from any ENG course, ENG 116 and above		2–4
	Computer Science or Physics Elective	Any 200-level or higher CS course not required or PHY 350	X	3
	Math Elective	MAT 256 or any MAT course greater than 300	X	3
	GAM 400	Project IV	X	5
	Elective	An elective of the student's choice from any department at DigiPen		3
	ART 210	Art Appreciation		2
Semester Total				20–23
Semester 8	English Elective	One English elective chosen from any ENG course, ENG 116 and above		2–4
	Computer Science or Physics Elective	Any 200-level or higher CS course not required or PHY 350	X	3
	Computer Science or Physics Elective	Any 200-level or higher CS course not required or PHY 350	X	3
	GAM 450	Project IV	X	5
	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				19–21
Degree Total				154 minimum

THE BS/MS IN COMPUTER SCIENCE ACCELERATED SCHEDULE

[Updated: July 2013]

Program Overview

DigiPen offers students in the Bachelor of Science in Computer Science in Real-Time Interactive Simulation program the opportunity to complete both BS in Computer Science in Real-Time Interactive Simulation and Master of Science in Computer Science programs through an accelerated schedule. The accelerated schedule permits students who meet the minimum requirements to take selected graduate-level courses during the junior and senior years of their undergraduate study and apply up to 15 credits towards both BS and MS degree requirements. Students who pursue the accelerated schedule will successfully complete their BS in Computer Science in Real-Time Interactive Simulation degree while at the same time beginning to extend their knowledge into the graduate level curriculum and allow students to finish both degree programs in five years sequentially (i.e., BS in Computer Science in Real-Time Interactive Simulation in 4 years, and then MS in Computer Science in 1 year).

Minimum Requirements

[Updated: July 2013]

To be considered for the BS/MS accelerated schedule, students must meet the following minimum requirements:

- Major: Bachelor of Science in Computer Science in Real-Time Interactive Simulation at DigiPen Institute of Technology
- Junior standing: students must have completed the 5th semester's study (the first semester of Junior year) or earned 93 or more credits of course work
- GPA in core courses: 3.00 or higher
- Petition to take graduate level CS electives
- Consent from the academic advisor in writing

The MS in Computer Science Admissions Committee will review the student's request of entering the accelerated schedule and inform the student within three weeks upon receiving the petition. Please note that the petition to be considered for the BS/MS accelerated schedule does not indicate admission to the MS in Computer Science degree program. Students must still apply for the MS in Computer Science program following the standard admission procedures.

Bachelor of Science in Computer Science and Game Design

PROGRAM OVERVIEW

[Updated: February 2013]

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 technical and creative sides of game development, able to work as an engineer or designer as needed. This degree program prepares graduates for precisely this “technical designer” role.

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. After many years in the industry, graduates may obtain titles such as lead engineer, lead designer, technical director, creative director, and director. 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.

DEGREE REQUIREMENTS

[Updated: June 2013]

Number of Credits and 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 15 weeks each, or four academic years.

Grade Requirements and Core Courses

Students must receive a grade of “C-” 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” is considered passing.) The core courses include all courses except general electives.

Humanities and Social Science Requirement

The following courses are required: COL 101, 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 Requirement

The following courses are required: ART 101 or ART 102, ART 125 or ART 126, ART 260, ART 310, CG 102 or CG 201, and CG 125 or CG 225. (Total: 18 credits)

Design Requirement

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. (Total: 29 credits)

Projects Requirement

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)

Computer Science Requirement

The following courses are required: CS 100 or CS 101, CS 120, CS 120L, CS 170, CS 170L, CS 180, CS 225, CS 230, CS 251, CS 280, CS 311, CS 330, and CS 380. (Total: 33 credits)

Mathematics Requirement

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 Requirement

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

Electives Requirement

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 BA in Computer Science and Game Design: COM 150 (3), ENG 110 (3), MAT 140 (4), MAT 150 or MAT 180 (4), MAT 200 or MAT 230 (4), MAT 258 (3), PHY 200 (3), PSY 101 (3), and one Humanities and Social Sciences elective (3), for a total of 30 credits.

RECOMMENDED COURSE SEQUENCE CHART

Updated January 26, 2015 [Please note that the following typos were corrected on this date: the misprint of the code for CS 120 in Semester 1 and the removal of an incorrectly printed course from Semester 4.]

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	CS 101	Introduction to Computer Environment	X	1
	CS 120	High-Level Programming I—The C Programming Language	X	3
	CS 120L	High-Level Programming I Lab	X	1
	COL 101	College Life and Academic Skills	X	1
	GAM 100	Project Introduction	X	3
	GAT 110	Game History	X	3
	MAT 140	Linear Algebra and Geometry	X	4
	GAT 120	Game Analysis	X	2
	PSY 101	Introduction to Psychology	X	3
	Semester Total			
Semester 2	CS 170	High-Level Programming II—The C++ Programming Language	X	3
	CS 170L	High-Level Programming II Lab	X	1
	CS 230	Game Implementation Techniques	X	3
	ENG 110	Composition	X	3
	GAM 150	Project I	X	3
	GAT 210	Game Mechanics I	X	3
	MAT 150 or MAT 180	Calculus and Analytic Geometry I or Vector Calculus I	X	4
	Semester Total			
Semester 3	CS 225	Advanced C/C++	X	3
	GAT 240	Technology for Designers	X	3
	MAT 200 or MAT 230	Calculus and Analytic Geometry II or Vector Calculus II	X	4
	PHY 200	Motion Dynamics	X	3
	GAT 211	Game Mechanics II	X	3
	GAM 200	Project II	X	4
	Semester Total			
Semester 4	CS 280	Data Structures	X	3
	COM 150	Interpersonal and Work Communication	X	3
	ART 102	Fundamentals of Visual Expression	X	3
	GAT 250	2D Game Design I	X	3
	CS 180	Operating System I, Man-Machine Interface	X	3
	GAM 250	Project II	X	4
	Semester Total			

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	CS 380	Artificial Intelligence for Games	X	3
	CS 251	Introduction to Computer Graphics	X	3
	ART 126	Principles of Composition and Design	X	3
	ART 260	Graphic Design, User Experience, and Input	X	3
	GAT 251	2D Game Design II	X	3
	GAM 302	Project III for Designers	X	5
	Semester Total			
Semester 6	ART 310	Architectural Spaces, Design, and Lighting I	X	3
	CG 125	Introduction to 3D Production for Designers	X	3
	CG 102	2D Raster and Vector Graphics for Designers	X	3
	GAT 315	3D Game Design I	X	3
	GAM 352	Project III for Designers	X	5
	MAT 258	Discrete Mathematics	X	3
	Semester Total			
Semester 7	CS 330	Algorithm Analysis	X	3
	GAT 315	3D Game Design I	X	3
	Design Elective	Any three-credit course with the GAT designation	X	3
	CS 311	Introduction to Databases	X	3
	MAT 340 or MAT 364	Probability and Statistics or Combinatorial Game Theory	X	3
	GAM 400	Project IV	X	5
	Semester Total			
Semester 8	General Elective	An elective of the student's choice from any department at DigiPen		3
	General Elective	An elective of the student's choice from any department at DigiPen		3
	HSS Elective	Any three-credit COM, ENG, ECN, HIS, LAW, PHL, PSY, or SOS course	X	3
	GAM 450	Project IV	X	5
	Semester Total			
Degree Total				154 minimum

Bachelor of Science in Computer Engineering

PROGRAM OVERVIEW

[Updated: July 2013]

The Computer Engineering (BSCE) degree program at DigiPen educates engineers to understand both sides of the hardware-software interface, from designing circuits to creating operating systems. Multidisciplinary in scope, the BSCE curriculum integrates the fields of electrical engineering and computer science. This program will uniquely prepare BSCE graduates to design and develop embedded, digital, and computer systems. Graduates with a degree in Computer Engineering will be highly skilled and ideally suited for twenty-first-century industries, including the games industry.

Like students in DigiPen's other degree programs, BSCE students will apply their theoretical learning through a variety of semester-long and year-long projects with critical feedback and evaluation from expert instructors. As they develop through the program, students will have increasingly more creative control over their projects. The BSCE curriculum and the student projects will focus on embedded systems, a term that refers to any device that uses a microprocessor or microcontroller. Embedded systems appear in a wide array of household, industrial, and military applications, including portable and console game systems, robots, game peripherals, electronic toys, digital cameras, audio/video component systems, and aircraft flight systems.

Applications of the computer engineering knowledge and skills students will gain through this degree include:

Technology Areas

- Game Systems
- Hardware/Electronic Toys
- Virtual Reality Hardware
- Human Interface Devices
- Robotics & Automation
- Artificial Intelligence
- Operating Systems
- Information Systems
- Telecommunications
- Signal Processing
- Control Systems & Instrumentation
- Multimedia

Application Domains

- Aerospace & Avionics
- Automotive
- Consumer Electronics
- Medical Sciences
- Internet
- Entertainment
- Military

The field of computer engineering has a real potential for innovation, and there is a growing demand for skilled graduates. For example, hardware design limits game software development, however BSCE graduates possess the proficiency to design and implement new hardware interfaces that will expand the bounds of video games and other interactive media.

Students who successfully complete the BSCE curriculum acquire the following:

- A broad foundation in mathematics, physics, and computer science, which allows students to remain up-to-date in the profession as tools and techniques evolve.
- A foundation in electrical engineering, which includes the principles of circuits with an emphasis on digital electronics, microprocessors, microcontrollers, and embedded systems.
- The ability to work in small teams to design, build, and test prototype systems typical of what are currently used in the industry.
- Strong foundational skills in system design, software engineering, coding, and system integration.
- Extensive skills in applied technology using industry-standard hardware and software.
- Professional attitude and work habits, including the ability to maintain a production schedule and to respond to professional criticism.
- Social perspective and civic accountability relative to the roles that technology plays in society.

Graduates of this degree program will have the necessary skills and preparation to work at entry-level positions in most computer technologies in general, and embedded systems development in particular. Potential entry-level position titles for new graduates include: Software Engineer, Computer Hardware Engineer, Systems Engineer, Embedded Systems Engineer, Embedded Software Engineer, Firmware Engineer, Design Engineer, Development Engineer, Quality Control Engineer, Systems Test Engineer, Telecommunications Engineer, Software Developer, Software Analyst, Computer Programmer and Graphics Hardware Engineer.

DEGREE REQUIREMENTS

[Updated: July 2013]

Number of Credits & GPA

The Bachelor of Science in Computer Engineering requires completion of at least 154 semester credits with a cumulative GPA of 2.0 or better. The program typically spans eight semesters of 15 weeks each, or four academic years.

Grade Requirements and Core Courses

Students must receive a grade of "C-" or higher in all core courses. All required CS, ECE, MAT, and PHY courses are considered core courses. (In a non-core course, a grade of "D" or higher is considered passing.)

Electrical and Computer Engineering Requirements

The following courses are required: ECE 110 or GAM 150, ECE 200, ECE 210, ECE 220L, ECE 260, ECE 270, ECE 300, ECE 310L, ECE 350, ECE 360L, ECE 400 or ECE 420, ECE 410L, and ECE 460L. (Total: 49 credits)

Computer Science Requirements

The following computer science courses are required: CS 100, CS 100L, CS 120, CS 120L, CS 170, CS 170L, CS 180, CS 225, CS 280, CS 315, and CS 330. In addition, students must take twelve semester credits of CS courses chosen from CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher. (Total: 36 credits)

Physics Requirements

PHY 200, PHY 200L, PHY 250, PHY 250L, PHY 270 and PHY 270L are required. (Total: 12 credits)

Mathematics Requirements

The following mathematics courses are required: MAT 140, MAT 150 or MAT 180, MAT 200 or MAT 230, MAT 225, MAT 256, MAT 258, and MAT 340. (Total: 24 credits)

Humanities and Social Science Requirements

The following courses are required: COL 101, COM 150, ENG 110, and ECN 350. Students must also take an additional three semester credits of ENG classes numbered 116 or higher. Additionally, students must take three semester credits of social science in HIS, SOS, PSY, PHL, or LAW. (Total: 16 credits)

Art and Music Requirements

The following course is required: ART 210. Students must also take an additional three semester credits of any ANI, ART, FLM, or MUS course. (Total: 5 credits)

Electives Requirements

Nine semester credits of electives of any of the courses offered at DigiPen and an advanced elective consisting of three semester credits from any CS, MAT, or PHY course numbered 200 or above, are required. (Total: 12 credits)

A Note on General Education Courses

The following courses satisfy the general education requirement for the BS in Computer Engineering: ENG 110 (3), COM 150 (3), social science elective (3), ART 210 (2), MAT 140 (4), MAT 150 or MAT 180 (4), MAT 200 or MAT 230 (4), PHY 200 (3), PHY 250 (3), and ECN 350 (3), for a total of 32 credits.

RECOMMENDED COURSE SEQUENCE CHART

[Updated: June 2013]

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	CS 120	High-Level Programming I—The C Programming Language	X	3
	CS 120L	High-Level Programming I Lab	X	1
	CS 100	Computer Environment I	X	3
	CS 100L	Computer Environment I Lab	X	1
	MAT 140	Linear Algebra and Geometry	X	4
	GAT 110	Game History	X	3
	MAT 150 or MAT 180	Calculus and Analytic Geometry I or Vector Calculus I	X	4
	COL 101	College Life and Academic Skills		1
	ENG 110	Composition		3
	Semester Total			20
Semester 2	CS 170	High-Level Programming II—The C++ Programming Language	X	3
	CS 170L	High-Level Programming II Lab	X	1
	MAT 200 or MAT 230	Calculus and Analytic Geometry II or Vector Calculus II	X	4
	ECE 210	Digital Electronics I	X	4
	PHY 200	Motion Dynamics		3
	PHY 200L	Motion Dynamics	X	1
	ECE 110	CE 1st Year Project	X	3
	Semester Total			19
Semester 3	CS 225	Advanced C/C++	X	3
	MAT 225	Calculus and Analytic Geometry III	X	3
	MAT 256	Introduction to Differential Equations	X	3
	ECE 220L	CE 2nd Year Project	X	3
	PHY 250	Waves, Optics, and Thermodynamics	X	3
	PHY 250L	Waves, Optics, and Thermodynamics Lab	X	1
	COM 150	Interpersonal and Work Communication		3
	Semester Total			19
Semester 4	CS 280	Data Structures	X	3
	ECE 200	Electric Circuits	X	3
	ECE 260	Digital Electronics II	X	4
	ECE 300	Embedded Microcontroller Systems	X	3
	PHY 270	Electricity and Magnetism	X	3
	PHY 270L	Electricity and Magnetism Lab	X	1
	MAT 258	Discrete Mathematics	X	4
		Semester Total		

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	CS 315	Low-Level Programming	X	3
	CS 330	Design and Analysis of Algorithms	X	3
	ECE 310L	CE 3rd Year Project I	X	5
	ART 210	Art Appreciation	X	2
	ECE 270	Real-Time Operating Systems	X	3
	CS Elective	Any of CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher	X	3
	Semester Total			
Semester 6	ECE 420	Digital Signal Processing	X	3
	ECE 360L	CE 3rd Year Project II	X	5
	CS/MAT/PHY Elective	An elective in CS, MAT, or PHY numbered 200 or above	X	3
	MAT 340	Probability and Statistics	X	3
	ECN 350	Engineering Economics		3
	Semester Total			
Semester 7	ECE 410L	CE 4th Year Project I	X	5
	ECE 350	Control Systems	X	3
	Art & Music Elective	Any ANI, ART, FLM, or MUS course		3
	ENG Elective	Any ENG course numbered 116 or higher		3
	General Elective	An elective of the student's choice from any department at DigiPen		3
	CS Elective	Any of CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher	X	3
	Semester Total			
Semester 8	ECE 460L	CE 4th Year Project II	X	5
	General Elective	An elective of the student's choice from any department at DigiPen		3
	General Elective	An elective of the student's choice from any department at DigiPen		3
	Social Science Elective	Any HIS, SOS, PSY, PHL, or LAW course		3
	CS Elective	Any of CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher	X	3
	CS Elective	Any of CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher	X	3
	Semester Total			
Degree Total				154 minimum

*Note: Please see the Degree Requirements section for an explanation of core courses.

Bachelor of Science in Engineering and Sound Design

[Updated: August 2013]

PROGRAM OVERVIEW

The BS in Engineering and Sound Design offers extensive training in basic science and software engineering fundamentals as well as solid training and project work in game development, music technology and sound design. Students have the opportunity to work on both individual and team-based projects to produce software technology and sound effects for video games, simulations, and other interactive media. Through lab courses in four of the eight semesters, these students gain expertise in working with computer software and hardware that is essential to the sound design and synthesis process. In three of the four years, students work on game development team projects, solidifying their skills as software developers. The balance between foundational science such as calculus, acoustics, and data structures, and applied laboratory project work in game development and sound design, gives the student the technical and creative experience to be a software engineer with special emphasis on the art and science of sound.

The Bachelor of Science in Engineering and Sound Design is a four-year undergraduate computer science degree program designed to prepare software engineers for careers in software development with an emphasis on music- and audio-related applications. The program includes training in computer audio, graphics and real-time simulation programming. Graduates of this program are prepared for the following entry and intermediate level positions: audio software engineer, audio engine programmer, engine and tools programmer, game developer, software engineer, software developer, computer programmer, audio production editor, recording engineer, sound designer, and dialog editor.

DEGREE REQUIREMENTS

Number of credits and GPA

The Bachelor of Science in Engineering and Sound Design requires completion of 141 credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of 15 weeks each, or four academic years.

Students must receive special permission in writing from their academic advisor to take more than 20 credits in either of their first two semesters.

Grade Requirements and Core Courses

Students must receive a grade of C- or better in all core courses for the Bachelor of Science in Engineering and Sound Design. (In a non-core course a grade of D is considered passing.) The core courses are: CS 100, CS 100L, CS 120, CS 120L, CS 170, CS 170L, CS 180, CS 225, CS 245, CS 246, CS 251, CS 280, ECE 200, GAM 100, GAM 150, GAM 200, GAM 250, GAM 300, GAM 350, MAT 140, MAT 150, MAT 200, MAT 220, MUS 120, MUS 120L, MUS 121, MUS 121L, MUS 150, MUS 150L, MUS 151, MUS 151L, MUS 250, MUS 250L, MUS 251, MUS 251L, PHY 200, PHY 250, PHY 320, PHY 321, and three MUS elective credits.

Computer Science Requirements

Required courses are: CS 100, CS 100L, CS 120, CS 120L, CS 170, CS 170L, CS 180, CS 225, CS 230, CS 245, CS 246, CS 251, CS 280, and six CS elective credits. (Total : 39 credits)

Electrical and Computer Engineering Requirements

Required courses are: ECE 200. (Total : 3 credits)

General Electives Requirements

Number of General Elective Credits Required: Six credits from any department at DigiPen.

Humanities and Social Sciences Requirements

Required courses are: COL 101, COM 150, ENG 110, LAW 115, and three HSS elective credits. (Total : 13 credits) Humanities and Social Sciences Electives HSS Electives include courses with the following prefixes: COM (Communications), ECN (Economics), ENG (English), HIS (History), LAW (Law), MGT (Management), PHL (Philosophy), PSY (Psychology), and SOS (Social Sciences).

Mathematics Requirements

Required courses are: MAT 140, MAT 150, MAT 200, MAT 220, and three MAT elective credits numbered higher than 200. (Total: 18 credits)

Music Requirements

Required courses are: MUS 120, MUS 120L, MUS 121, MUS 121L, MUS 150, MUS 150L, MUS 151, MUS 151L, MUS 250, MUS 250L, MUS 251, MUS 251L, and three MUS elective credits. (Total: 23 credits)

Physics Requirements

Required courses are: PHY 200, PHY 250, PHY 320, PHY 321. (Total : 12 credits)

Projects Requirements

Required courses are: GAM 100, GAM 150, GAM 200, GAM 250, GAM 300, GAM 350. (Total : 24 credits)

Film Requirements

Required course is: FLM 115. (Total: 3 credits)

Internship Option

Students have the option to replace the courses: GAM 350 and with the internship course GAM 390. All internships must be approved in writing by the program director and internship coordinator, and comply with the DigiPen internship guidelines.

Note on General Education Courses

The following courses satisfy the general education requirement for the Bachelor of Science in Engineering and Sound Design: COM 150, ENG 110, FLM 115, LAW 115, MAT 140, MAT 150, MAT 200, PHY 200, PHY 250, and three HSS elective credits. Total general education credits: 33.

RECOMMENDED COURSE SEQUENCE CHART

[Updated: June 2013]

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	COL 101	College Life and Academic Skills		1
	CS 100	Computer Environment I	X	3
	CS 100L	Computer Environment I Lab	X	1
	CS 120	High-Level Programming I—The C Programming Language	X	3
	CS 120L	High-Level Programming I Lab	X	1
	GAM 100	Project Introduction	X	3
	MAT 140	Linear Algebra and Geometry	X	4
	MUS 120	Music Theory and Musicianship I	X	2
	MUS 120L	Music Theory and Musicianship I Lab	X	1
	Semester Total			
Semester 2	CS 170	High-Level Programming II—The C++ Programming Language	X	3
	CS 170L	High-Level Programming II Lab	X	1
	CS 230	Game Implementation Techniques		3
	GAM 150	Project I	X	3
	MAT 150	Calculus and Analytic Geometry I	X	4
	MUS 121	Music Theory and Musicianship II	X	2
	MUS 121L	Music Theory and Musicianship II Lab	X	1
	Semester Total			
Semester 3	CS 180	Operating System I: Man-Machine Interface	X	3
	CS 225	Advanced C/C++	X	3
	ENG 110	Composition		3
	MAT 200	Calculus and Analytic Geometry II	X	4
	MUS 150	Sound Design Project I	X	2
	MUS 150L	Sound Design Project I Lab	X	2
	PHY 200	Motion Dynamics	X	3
	Semester Total			
Semester 4	ECE 200	Electric Circuits	X	3
	CS 245	Introduction to Interactive Sound Synthesis	X	3
	FLM 115	History of Film and Animation		3
	MAT 220	Mathematics of Digital Sound Processing	X	3
	MUS 151	Sound Design Project II	X	2
	MUS 151L	Sound Design Project II Lab	X	2
	PHY 250	Waves, Optics, and Aerodynamics	X	3
	Semester Total			

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	CS 246	Advanced Sound Synthesis	X	3
	CS 251	Introduction to Computer Graphics	X	3
	GAM 200	Project II	X	4
	MUS 250	Sound Design Project III	X	1
	MUS 250L	Sound Design Project III Lab	X	2
	PHY 320	Acoustics I	X	3
	Semester Total			
Semester 6	CS 280	Data Structures	X	3
	CS Elective	Computer Science Elective	X	3
	GAM 250	Project II	X	4
	MUS 251	Sound Design Project IV	X	1
	MUS 251L	Sound Design Project IV Lab		2
	PHY 321	Acoustics II		3
	Semester Total			
Semester 7	COM 150	Interpersonal and Work Communication		3
	CS Elective	Computer Science Elective	X	3
	GAM 300	Project III	X	5
	General Elective	General Elective		3
	MAT Elective	Math Elective		3
	Semester Total			
Semester 8	GAM 350	Project III	X	5
	General Elective	An elective of the student's choice from any department at DigiPen		3
	HSS Elective	Humanities and Social Sciences Elective		3
	LAW 115	Introduction to Intellectual Property and Contracts	X	3
	MUS Elective	Music Elective	X	3
	Semester Total			
Degree Total				141 minimum

Bachelor of Fine Arts in Digital Art and Animation

[Updated: August 2013]

PROGRAM OVERVIEW

As the animation and video game 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.

Digital art and animation remain viable career opportunities for graduates possessing these abilities. 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 demand highly structured curricula and programmed sequencing simply to enable most students to be successful. Some students are capable of the rapid assimilation of the integrated knowledge the studios now require, but most are better served by a deeper and more sequential approach to the material.

DigiPen's BFA in Digital Art and Animation seeks to address these needs. Examples of student projects can be found in the DigiPen's Digital Gallery. Students who successfully complete this curriculum will possess the following skills and appropriate samples of professional work:

- A broad foundation of production experiences 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, Level Designer, UI Designer, Technical Artist, Producer, Project Manager, Composer, 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 BFA 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 better (2.0 GPA). The program usually spans eight semesters of 15 weeks each, or four academic years.

Grade Requirement and Core Courses

Certain non-elective courses which 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 better). All other courses, required or elective, are core courses and students must receive a grade of "C-" or higher to pass.

Animation Requirements

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

Art Requirements

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 Requirements

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

Elective Requirements

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 Requirements

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

Humanities and Social Science Requirements

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

Projects Requirements

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), (3), 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 CHART

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
	COL 101	College Life and Academic Skills	X	1
	Semester Total			
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			
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			
Semester 4	FLM 201 or FLM 210	Cinematography or Cinematography for Visual Effects	X	3
	ART 251	Character Design	X	3
	ART 350	Storyboards		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
	PRJ 251	2D Vector Animation	X	5
	Semester Total			

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	ANI 300 or Elective	Acting through an Interface or **any course from the Elective Requirements list.	X	3
	ART 300	Perspective, 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			
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
	PHY 115	Introduction to Applied Math and Physics		3
	CG 350 or Elective	Graphics for Gaming or **any course from the Elective Requirements list	X	3
	PRJ 350	3D Animation Production	X	5
	Semester Total			
Semester 7	ART 401	Interpersonal and Work Communication		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
	ART 450	Portfolio		3
	PRJ 400	Capstone Project I		5
	Semester Total			
Semester 8	ANI 400 or Elective	Cinematic Animation or **any course from the Elective Requirements list	X	3
	SOS 115	Media and Ethics: A Social Science Perspective		3
	CS 115	Introduction to Scripting and Programming		3
	LAW 115	Introduction to Intellectual Property and Contracts		3
	PRJ 450	Capstone Project II	X	5
	Semester Total			
Degree Total				145 minimum

*Note: Please see the Degree Requirements for an explanation of core courses.

**Note: Please refer to the Elective Requirements.

Bachelor of Arts in Game Design

[Updated: June 2013]

PROGRAM OVERVIEW

The field of digital entertainment has moved from an era where designers were self-taught and learned on the job, to one where even entry-level designers are expected to be well-trained with proven design skills, along with an understanding of technology, art, audio, narrative, and psychology. Designing digital entertainment is ultimately about breathing life into every aspect of what would otherwise be lifeless code and static pixels on a screen. Designers must continually place themselves in the heads and hearts of their players, shaping every action, every response, the ebb-and-flow of the game's intensity, and then skillfully blend the mechanical, spatial, narrative, visual, and aural aspects of the entire experience. This degree program prepares graduates to be a modern game designer, capable of working in large teams, communicating and collaborating with other designers, artists, and engineers, and able to create an experience that is greater than the sum of its parts.

Graduates will be extremely well versed in game design theory for digital and non-digital games, level design, system design, and behavior design. 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. However, modern game designers must have a much greater breadth of knowledge than just design. Graduates will also learn the basics of programming, art, psychology, and writing, along with an introduction to sound design, economics, statistics, and probability. Students can bolster any one of these areas by taking additional courses to emphasize skills in narrative design, world design, character design, visual design, sound design, or psychology.

Graduates of this degree program will be prepared to enter the video game industry as entry-level game designers. Possible entry-level position titles include game scripter, technical designer, system designer, level designer, content designer, encounter designer, user interface designer, quest designer, and game designer. After many years in the industry, graduates may obtain titles such as lead designer, creative director, and director. This degree program also includes secondary training that can contribute directly to a graduate obtaining positions with titles such as producer, program manager, writer, technical writer, editor, artist, or technical artist.

DEGREE REQUIREMENTS

Number of Credits & GPA

The Bachelor of Arts in Game Design requires completion of at least 147 semester credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of 15 weeks each, or four academic years.

Grade Requirements and Core Courses

Students must receive a grade of "C-" or higher in all core courses for the BA in Game Design major. (In a non-core course, a grade of "D" is considered passing.) The core courses include all courses except general electives.

Humanities and Social Science Requirement

The following courses are required: COL 101, COM 150, ENG 110, ENG 120, ECN 100, PSY 101, and PSY 201. Three additional credits must be selected from other courses with the designation COM, ENG, ECN, HIS, LAW, PHL, PSY, or SOS. (Total: 22 credits)

Art Requirement

The following courses are required: ART 101 or ART 102, ART 125 or ART 126, ART 260, ART 310, CG 102 or CG 201, CG 125 or CG 225, and FLM 151. (Total: 21 credits)

Music Requirement

Students must take MUS 115. (Total: 3 credits)

Design Requirement

The following courses are required: GAT 110, GAT 120, GAT 210, GAT 211, GAT 212, GAT 240, GAT 250, GAT 251, GAT 315, GAT 316, and GAT 330. Three additional credits must be selected from other courses with the designation GAT. (Total: 35 credits)

Projects Requirement

The following courses are required: GAM 100, GAM 152, GAM 205, GAM 255, GAM 302, GAM 352 and MGT 451. Two courses from the following list are also required: GAM 375, GAM 390, GAM 400, GAM 450, and GAM 490. (Total: 37 credits)

Mathematics Requirement

Students must take MAT 100 or MAT 140, and MAT 105. (Total: 7 credits)

Science Requirement

Students must take PHY 115 or PHY 200. (Total: 3 credits)

Computer Science Requirement

The following courses are required: CS 116, CS 170 or CS 175, and CS 176 or CS 225. A combination of CS 120 and CS 101 or CS 120 and CS 100 can replace CS 116. (Total: 10 credits)

Advanced Electives

Students are required to take nine credits of advanced electives, which must be selected from any courses in any department at DigiPen that are designated as 200 level or higher, other than GAM, GAT, or PRJ courses. (Total: 9 credits)

Note on General Education Courses

The following courses satisfy the general education requirement for the BAGD: COM 150 (3), ENG 110 (3), ENG 120 (3), ECN 100 (3), MAT 100 or MAT 140 (4), MAT 105 (3), PSY 101 (3), PSY 201 (3), PHY 115 or PHY 200 (3), and one Humanities and Social Sciences elective (3), for a total of 31 credits.

RECOMMENDED COURSE SEQUENCE CHART

Updated October 7, 2014 [Please note that the following typos were corrected on this date: the omission of the required course GAT 212 in Semester 6 and the required course GAM 450 (incorrectly printed as LAW 115) in Semester 8.]

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	COL 101	College Life and Academic Skills	X	1
	GAT 120	Game Analysis	X	2
	CS 116	Introduction to Computer Technology and Programming	X	4
	GAM 100	Project Introduction	X	3
	GAT 110	Game History	X	3
	PSY 101	Introduction to Psychology	X	3
	MAT 100	Pre-Calculus with Linear Algebra and Geometry	X	4
	Semester Total			
Semester 2	ART 102	Fundamentals of Visual Expression	X	3
	MAT 105	Introductory Probability and Statistics	X	3
	ENG 110	Composition	X	3
	GAT 210	Game Mechanics I	X	3
	GAM 152	Project I for Designers	X	3
	CS 175	Scripting Languages	X	3
	PHY 115	Introduction to Applied Math and Physics	X	3
	Semester Total			
Semester 3	GAM 205	Project II for Designers	X	4
	PSY 201	Cognitive Psychology	X	3
	CS 176	Advanced Scripting	X	3
	GAT 211	Game Mechanics II	X	3
	GAT 240	Technology for Designers	X	3
	ART 126	Principles of Composition and Design	X	3
	Semester Total			
Semester 4	GAT 250	2D Game Design I	X	3
	GAM 255	Project II for Designers	X	4
	ENG 120	Research, Reasoning, and Writing	X	3
	COM 150	Interpersonal and Work Communication	X	3
	CG 102	2D Raster Graphics and Animation for Designers	X	3
	CG 125	Introduction to 3D Production for Designers	X	3
	Semester Total			

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	GAT 251	2D Game Design II	X	3
	FLM 151	Visual Language and Film Analysis	X	3
	MUS 115	Fundamentals of Music and Sound Design	X	3
	Advanced Elective	A 200 level or higher elective of the student's choice from any department at DigiPen	X	3
	ART 260	Graphic Design, User Experience, and Input	X	3
	GAM 302	Project III for Designers	X	5
	Semester Total			
Semester 6	ART 310	Architectural Spaces, Design, and Lighting I	X	3
	GAT 212	Advanced Game Mechanics	X	3
	GAT 315	3D Game Design I	X	3
	ECN 100	Introduction to Economics		3
	Advanced Elective	A 200 level or higher elective of the student's choice from any department at DigiPen	X	3
	GAM 352	Project III for Designers	X	5
	Semester Total			
Semester 7	GAT 316	3D Game Design II	X	3
	GAT 330	Interactive Narrative and Character Creation for Games	X	3
	Advanced Elective	A 200 level or higher elective of the student's choice from any department at DigiPen	X	3
	GAM 400	Project IV	X	5
	Semester Total			
Semester 8	Design Elective	Any three-credit course with the GAT designation	X	3
	HSS Elective	Any three-credit course from the Department of Humanities and Social Sciences offered at DigiPen	X	3
	MGT 451	Project Management	X	3
	GAM 450	Project IV	X	5
	Semester Total			
Degree Total				147 minimum

Bachelor of Arts in Music and Sound Design

PROGRAM OVERVIEW

The BA in Music and Sound Design offers extensive training in music fundamentals such as music theory, music history and literature, composition, and ear-training, as well as solid training and project work in music technology and sound design. Students have the opportunity to work on both individual and team-based projects to produce musical scores and sound effects for video games, animations, and other interactive media. Through lab courses in each of the eight semesters, these students gain expertise in working with computer software and hardware that is essential to the sound design and synthesis process. The balance between music fundamentals, including composition, instrumental or vocal performance, and laboratory projects, gives the student the technical and creative experience to be a sound designer.

The Bachelor of Arts in Music and Sound Design prepares musicians for a wide variety of music- and audio-related careers and job opportunities in existing and emerging industries such as video games, film and animation, theater, radio, television, and web/new media. This four-year undergraduate degree program includes training in music composition and performance, audio recording technology, and music and sound design and production for video games and new media. Graduates of this program are prepared for the following entry and intermediate level positions: sound designer, music composer, music arranger, recording engineer, audio production editor, dialog editor, music supervisor, music editor, copyist/engraver, music librarian, music supervisor, music performer, and music teacher.

DEGREE REQUIREMENTS

[Updated: July 2013]

Number of Credits and GPA

The Bachelor of Arts in Music and Sound Design requires completion of 135 credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of 15 weeks each, or four academic years.

Students must receive special permission in writing from their academic advisor to take more than 20 credits in either of their first two semesters.

Grade Requirements and Core Courses

Students must receive a grade of C- or better in all core courses for the Bachelor of Arts in Music and Sound Design. (In a non-core course a grade of D is considered passing.) The core courses are: MUS 110, MUS 111, MUS 120, MUS 120L, MUS 121, MUS 121L, MUS 150, MUS 150L, MUS 151, MUS 151L, MUS 210, MUS 211, MUS 220, MUS 220L, MUS 221, MUS 221L, MUS 230, MUS 231, MUS 250, MUS 250L, MUS 251, MUS 251L, MUS 260, MUS 261, MUS 310, MUS 311, MUS 316, MUS 320, MUS 321, MUS 322, MUS 330, MUS 331, MUS 350, MUS 350L, MUS 351, MUS 351L, MUS 410, MUS 411, MUS 415, MUS 416, MUS 450, MUS 450L, MUS 451, MUS 451L, and 9 MUS elective credits.

Computer Science Requirements

Required courses are: CS 116, CS 175. (Total : 7 credits)

Game Design and Development Requirements

Required courses are: GAT 110. (Total : 3 credits)

General Electives Requirements

Number of General Elective Credits Required: 9 credits from any department at DigiPen.

Humanities and Social Sciences Requirements

Required courses are: COL 101, COM 150, ENG 110, ENG ELEC, LAW 115, and 9 HSS elective credits. (Total : 22 credits)

Humanities and Social Sciences Electives

HSS Electives include courses with the following prefixes:

COM (Communications), ECN (Economics), ENG (English), HIS (History), LAW (Law), MGT (Management), PHL (Philosophy), PSY (Psychology), and SOS (Social Sciences).

Mathematics Requirements

Required courses are: MAT 120. (Total : 3 credits)

Music Requirements

Required courses are: MUS 110, MUS 111, MUS 120, MUS 120L, MUS 121, MUS 121L, MUS 150, MUS 150L, MUS 151, MUS 151L, MUS 210, MUS 211, MUS 220, MUS 220L, MUS 221, MUS 221L, MUS 230, MUS 231, MUS 250, MUS 250L, MUS 251, MUS 251L, MUS 260, MUS 261, MUS 310, MUS 311 or MUS 316, MUS 320, MUS 321, MUS 322, MUS 330, MUS 331, MUS 350, MUS 350L, MUS 351, MUS 351L, MUS 410 or MUS 415, MUS 411 or MUS 416, MUS 450, MUS 450L, MUS 451, MUS 451L, and 9 MUS elective credits. (Total: 79 credits)

Physics Requirements

Required courses are: PHY 115, PHY 116. (Total: 6 credits)

Film Requirements

Required courses are: FLM 115 and FLM 151. (Total: 6 credits)

Internship Option

Students have the option to replace one of the pairs of courses: MUS 450 and MUS 450L, or MUS 451 and MUS 451L, with the internship course MUS 390. All internships must be approved in writing by the program director and internship coordinator, and comply with the DigiPen internship guidelines.

Note on General Education Courses

The following courses satisfy the general education requirement for the Bachelor of Arts in Music and Sound Design: COM 150, ENG 110, FLM 115, LAW 115, PHY 115, PHY 116, and nine HSS elective credits, and three ENG elective credits. Total general education credits: 30.

RECOMMENDED COURSE SEQUENCE CHART

[Updated: June 2013]

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	COL 101	College Life and Academic Skills		1
	ENG 110	Game Analysis		3
	FLM 115	Introduction to Computer Technology and Programming		3
	MAT 120	Project Introduction		3
	MUS 110	Game History	X	1
	MUS 120	Introduction to Psychology	X	2
	MUS 120L	Pre-Calculus with Linear Algebra and Geometry	X	1
	MUS 150	Sound Design Project I	X	2
	MUS 150L	Sound Design Project I Lab	X	2
	Semester Total			
Semester 2	COM 150	Interpersonal and Work Communication		3
	FLM 151	Visual Language and Film Analysis		3
	MUS 111	Private Lessons II: Instrumental or Vocal	X	1
	MUS 121	Music Theory and Musicianship II	X	2
	MUS 121L	Music Theory and Musicianship II Lab	X	1
	MUS 151	Sound Design Project II	X	2
	MUS 151L	Sound Design Project Lab	X	2
	PHY 115	Introduction to Applied Math and Physics		3
	Semester Total			
Semester 3	CS 116	Introduction to Computer Technology and Programming		4
	MUS 210	Private Lessons III: Instrumental or Vocal	X	1
	MUS 220	Music Theory and Musicianship III	X	2
	MUS 220L	Music Theory and Musicianship III Lab	X	1
	MUS 230	Composition I	X	2
	MUS 250	Sound Design Project III	X	1
	MUS 250L	Sound Design Project III Lab	X	2
	MUS 260	Music History and Literature I	X	3
	Semester Total			
Semester 4	CS 175	Scripting Languages		3
	HSS Elective	Humanities and Social Sciences at Elective		3
	MUS 211	Private Lessons IV: Instrumental or Vocal	X	1
	MUS 221	Music Theory and Musicianship IV	X	2
	MUS 221L	Music Theory and Musicianship IV Lab	X	1
	MUS 231	Composition II	X	2
	MUS 251	Sound Design Project IV	X	1
	MUS 251L	Sound Design Project IV Lab	X	2
	MUS 261	Music History and Literature II	X	3
	Semester Total			

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	ENG Elective	English Elective		3
	HSS Elective	Humanities and Social Sciences Elective		3
	MUS 310	Private Lessons V: Instrumental or Vocal	X	1
	MUS 320	Conducting and Instrumentation	X	2
	MUS 330	Advanced Composition I	X	3
	MUS 350	Sound Design Project V	X	1
	MUS 350L	Sound Design Project V Lab	X	2
	PHY 116	Physics of Music and Sound		3
	Semester Total			
Semester 6	GAT 110	Game History		3
	MUS 311	Private Lessons VI: Instrumental or Vocal	X	1
	MUS 321	Introduction to Orchestration	X	3
	MUS 322	Adaptive Music for Video Games	X	3
	MUS 331	Advanced Composition II	X	3
	MUS 351	Sound Design Project VI	X	1
	MUS 351L	Sound Design Project VI Lab	X	2
	Semester Total			
Semester 7	Elective	Any course from any department at DigiPen		3
	Elective	Any course from any department at DigiPen		3
	HSS Elective	Humanities and Social Sciences Elective		3
	MUS 410	Private Lessons VII: Instrumental or Vocal	X	1
	MUS 450	Sound Design Project VII	X	1
	MUS 450L	Sound Design Project VII Lab	X	2
	MUS Elective	Any MUS Course	X	3
	Semester Total			
Semester 8	Elective	Any course from any department at DigiPen		3
	LAW 115	Introduction to Intellectual Property and Contracts		3
	MUS 411	Private Lessons VIII: Instrumental or Vocal	X	1
	MUS 451	Sound Design Project VIII	X	1
	MUS 451L	Sound Design Project VIII Lab	X	2
	MUS Elective	Music Elective	X	3
	MUS Elective	Music Elective	X	3
	Semester Total			
Degree Total				135 minimum

Master of Science in Computer Science

PROGRAM OVERVIEW

[Updated: August 2013]

Driven by thriving technology and innovations, the interactive real-time simulation software and video game industry is an exciting and dynamic field with active research that is still young and offers tremendous opportunities to talented people. The number of people involved in different game production activities (game console, personal computer, hand-held, online, wireless devices, etc.) has been rising. Three-dimensional computer graphics, artificial intelligence (AI), networking, and distributed computing technology continue to drive innovations in both hardware and software. Real-time animation and realistic rendering techniques have also demonstrated many application potentials in movies, television commercials, scientific visualization, medical studies, military training, and other industries and fields.

Gaming companies increasingly demand leading programmers and engineers with an in-depth comprehension of and a solid background in mathematics, physics, real-time rendering, AI, graphics programming, and networking. On the other hand, many developers currently working in the field have been seeking postgraduate education to update their knowledge, to sharpen their professional skills, or to advance in the industry. However, the curriculum taught in many colleges and universities lacks a focus on implementation of these exclusive objectives. Consequently, both companies and individuals feel that a general four-year computer science bachelor's degree program is inadequate and limits them from advancing professionally in careers related to the theory and technology involved in real-time simulations. More directed, extensive education at a postgraduate level is needed.

DigiPen Institute of Technology has been teaching the Bachelor of Science in Computer Science in Real-Time Interactive Simulation since 1998. This degree provides both academic and practical training for programming computer games. It has been highly successful, and DigiPen has received much recognition for this achievement. Building on this success, the Institute offers a Master of Science in Computer Science to meet the postgraduate education need.

While many developers currently working in the field have been seeking postgraduate education to update their knowledge, to sharpen their professional skills, or to advance in the industry, they have the difficult challenge of balancing busy production schedules and professional growth. Additionally, for many of them, leaving a full-time job to pursue full-time graduate studies is simply not an option.

For these reasons, DigiPen also offers the Part-Time Master of Science in Computer Science degree. This program provides an opportunity for those who currently work in a video game company or have a full-time job in another industry and want to expand their knowledge of academic fundamentals in an advanced study of Computer Science and applications in interactive simulation.

This program specializes in real-time interactive simulation and is designed to attract talented students who have recently

graduated with a bachelor's degree in one of the following disciplines:

- Computer Science
- Computer Engineering or related studies
- A general field, along with some computer science studies or game industry experience

The Master of Science in Computer Science degree program offers extended education in areas of 3D computer graphics, animation and modeling techniques, AI algorithms, image processing, and real-time rendering. It combines this with related training in computer science, mathematics, and physics.

This graduate program at DigiPen provides an opportunity for students to expand their knowledge of academic fundamentals in 3D computer graphics. Students who successfully complete this master's degree program will possess and/or improve the following professional skills:

- In-depth foundation in mathematics and physics, such as implicit curves and surfaces, theory and applications of quaternions, differential geometry, computational geometry, graph theory, advanced numerical analysis, fuzzy logic and sets, number theory and cryptography, and finite elements.
- Advanced knowledge in computer science, including advanced animation and modeling algorithms (interpolation, rigid body, deformable object, inverse kinematics, natural phenomena simulation, facial expression, motion blending and capture, etc.), advanced rendering techniques (shader programming, lighting techniques, HDR, shading and shadows, anti-aliasing, etc.), artificial intelligence (reinforcement learning, neural network, advanced search algorithms, uncertainty handling, etc.), game engine design (levels of detail, implicit surfaces, pipeline optimization, advanced intersection and collision detection, etc.), physically-based modeling algorithms, ray tracing, and radiosity.
- Solid hands-on experience on game projects, including advanced game (single- or multi-player) design, documentation, project management, marketing, networking, distributed systems, streaming media testing, and working with external contractors.
- Strong capability of academic research in the area of 3D computer graphics and AI, including virtual reality, illumination and shading algorithms, animation techniques, surface representation and rendering, volume visualization and morphing algorithms, geometry, modeling, path finding, and searching and planning algorithms.

Computer technology pervades modern society. Those who thoroughly understand it have a wide range of rewarding career options. This graduate degree program prepares students specifically for advanced career choices and job opportunities in existing and emerging industries where skills in computer graphics, AI, real-time simulation programming, and networking are in great demand. These include the video game, computer-based modeling, aerospace, server back-end, and medical industries just to name a few. Graduates of this program may attain occupations as software engineers, software developers, computer programmers, engine programmers, graphics programmers, tools programmers, AI programmers, gameplay programmers, and physics engine programmers.

Master of Fine Arts in Digital Arts

PROGRAM OVERVIEW

[Updated: August 2013]

As the animation and game industries grow, so does the demand for highly skilled and creative digital artists. The rapid advances in technology allow for a broader range of styles and greater flexibility in visual expression, particularly in real-time interactive entertainment. As the industries continue to evolve, they demand creative vision and original art beyond the production of assets.

To meet this demand, DigiPen's Master of Fine Arts in Digital Arts offers a graduate level education with an emphasis on traditional art techniques, creativity and personal voice. The DigiPen faculty has crafted curriculum that focuses on the art first while also serving the needs of industry. DigiPen's unique curriculum requires the application of these skills in a digital context. Not only will alumni be prepared for the 3D graphics industry, they will have the tools and vision to become leaders who can advance the arts in video games and animated films.

The MFA in Digital Arts emphasizes foundational studies such as anatomy, figure drawing, sculpture, art history, design, and color theory. Students will also become proficient in character design, traditional sculpting, digital sculpting, hard surface modeling, lighting, texturing, rendering, and rigging. Students combine these studies with original research to create innovative digital work for a thesis project.

MFA in Digital Arts candidates will be required to focus on areas of specialization and demonstrate mastery of their chosen fields. MFA in Digital Arts graduates' portfolios will exhibit a level of proficiency commensurate with specialists in the industry and will be qualified for jobs such as: 3D artist, 3D modeler, animator, character artist, technical artist, texture artist, environment artist or art instructor. In addition, some of the most successful MFA in Digital Arts graduates may attain jobs such as: art lead, art director, senior artist, and senior character artist.

DEGREE REQUIREMENTS

[Updated: July 2013]

Number of Credits and GPA

The MFA in Digital Arts requires completion of at least 60 semester credits with a cumulative GPA of 3.0 or better. The program typically spans 4 semesters of 15 weeks each, generally accomplished in two calendar years.

Digital Arts Requirements

The following computer graphics courses are required: CG 521, CG 525, CG 620, CG 501, and CG 605. (Total: 15 credits)

Elective Requirements

Students must take five electives for a total of fifteen credits. The electives are as follows:

- ART or CG ELECTIVE: Students must select three courses from any ART or CG course numbered 500 or higher.

- Cross-Disciplinary Elective: Students must select one course from CSX, MGT, BIOX, PHYX, or GAMX numbered 500 or higher.
- ANY ELECTIVE. Students must select one course from any graduate level offering (500 or higher) at DigiPen. (Total: 15 credits)

Fine Arts Requirements

The following art courses are required: ART 501, ART 515, ART 516, ART 517, ART 522, ART 528, ART 555. (Total: 21 credits)

Thesis Requirements

The following thesis courses are required: PRJ 690, PRJ 701, and PRJ 702. (Total: 9 credits)

MFA in Digital Arts Curriculum

Listed below are all the graduate-level courses currently offered at DigiPen and appropriate to the Masters of Fine Arts in Digital Arts program. Courses designated with an "R" are required for the MFA, courses designated with an "E" are appropriate as electives within the program.

The MFA in Digital Arts requires 60 credits total, 45 of which are specifically required and fifteen (15) credits are elective.

COURSE	COURSE TITLE	R/E	CREDITS
ART 501	Advanced Figure Drawing	R	3
ART 515	Art History: Classical to Renaissance	R	3
ART 516	Art History: 19th–21st Century	R	3
ART 517	Art History: Research Seminar	R	3
MUS 110	Character Design	R	3
ART 522	Advanced Figure Sculpting	R	3
ART 528	Anatomy: Ecorché	R	3
ART 555	3D Concepts & Production	R	3
CG 501	Organic and Hard Surface Modeling	R	3
CG 521	Digital Painting: Composition and Color	R	3
CG 525	Digital Sculpting	R	3
CG 605	Lighting and Rendering	R	3
CG 620	Thesis I: Proposal Pre-Production	R	3
PRJ 690	Thesis II	R	3
PRJ 701	Thesis III	R	3
PRJ 702	Gesture Drawing	E	3
ART 503	Storyboarding	E	3
ART 504	Oil Painting—The Figure	E	3
ART 511	Plein Aire Painting	E	3
ART 512	Human Anatomy	E	3
BIOX 500	Animal Anatomy and Locomotion	E	3
BIOX 550	Digital Painting—Matte and Background	E	3
CG 570	Facial Rigging and Animation	E	3
CG 577	Special Topics	E	3
CG 599	Advanced Character Creation	E	3
CG 661	Character Rigging	E	3
CG 675	Scripting for Games	E	3
CSX 510	Cinematography and The Art of The Story	E	3
FLM 508	Game Design, Development and Production	E	3
GAMX 500	Music Theory and Musicianship IV Lab	E	3
MCM 600	Master's Continuous Matriculation	E	1
MGT 500	Management for Art Directors	E	3
PHYX 510	Physics for Animation and Modeling	E	3

RECOMMENDED COURSE SEQUENCE CHART

Full-Time MFA in Digital Arts

SEMESTER	COURSE	COURSE TITLE	R/E	CREDITS
Semester 1	ART 501	Advanced Figure Drawing	R	3
	ART 555	Anatomy: Ecorché	R	3
	CG 501	3D Concepts and Production	R	3
	CG 525	Digital Painting: Composition and Color	R	3
	ART 515	Art History: Classical to Renaissance	R	3
	Semester Total			
Semester 2	ART 522	Character Design	R	3
	ART 528	Advanced Figure Sculpting	R	3
	CG 521	Organic and Hard Surface Modeling	R	3
	ART 516	Art History: 19th to 21st Century	R	3
	PRJ 690	Thesis I: Proposal Pre-Production	R	3
	Semester Total			
Semester 3	CG 605	Digital Sculpting	R	3
	Elective	Any ART or CG Elective*	E	3
	CG 620	Lighting and Rendering	R	3
	PRJ 701	Thesis II	R	3
	Elective	Any ART or CG Elective*	E	3
	Semester Total			
Semester 4	ART 517	Art History: Research Seminar	R	3
	Elective	Any ART or CG Elective*	E	3
	Elective	Any course offered at DigiPen*	E	3
	Elective	Cross-Disciplinary Elective*	E	3
	PRJ 702	Thesis III	R	3
	Semester Total			
Degree Total				60*

*Note: electives must be selected from courses offered at DigiPen and numbered 500 or higher. Courses may have prerequisites that should be taken into consideration by the student and discussed with his/her advisor.

RECOMMENDED COURSE SEQUENCE CHART

Part-Time MFA in Digital Arts

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	ART 501	Advanced Figure Drawing	R	3
	ART 555	Anatomy: Ecorché	R	3
	CG 501	3D Concepts and Production	R	3
	Semester Total			
Semester 2	ART 522	Character Design	R	3
	ART 528	Advanced Figure Sculpting	R	3
	CG 521	Organic and Hard Surface Modeling	R	3
	Semester Total			
Semester 3	CG 525	Digital Painting Color and Composition	R	3
	ART 515	Art History: Classical to Renaissance	R	3
	CG 605	Digital Sculpting	R	3
	Semester Total			
Semester 4	ART 516	Art History: 19th to 21st Century	R	3
	Elective	Any ART or CG Elective*	E	3
	Semester Total			
Semester 5	CG 620	Lighting and Rendering	R	3
	Elective	Any ART or CG Elective*	E	3
	Semester Total			
Semester 6	ART 517	Art History: Research Seminar	R	3
	Elective	Any ART or CG Elective*	E	3
	PRJ 690	Thesis I: Proposal Pre-Production	R	3
	Semester Total			
Semester 7	PRJ 701	Thesis II	R	3
	Elective	Any course offered at DigiPen*	R	3
	Semester Total			
Semester 8	Elective	Cross-Disciplinary Elective*	E	3
	PRJ 702	Thesis III	R	3
	Semester Total			
Degree Total				60*

*Note: electives must be selected from courses offered at DigiPen and numbered 500 or higher. Courses may have prerequisites that should be taken into consideration by the student and discussed with their advisor.

Course Descriptions for the Academic Year 2013–2014

Department of Animation and Production

ANIMATION COURSES

ANI 400 Cinematic Animation (3 Cr.)

[Updated: May 2013]

Prerequisite(s): ANI 350, ART 401, MUS 115

This course is a culmination of the student's ability to use animation as a storytelling medium. It also provides an opportunity for the student to demonstrate his or her personal artistic growth. Each student works to complete a short piece of cinematic animation. Working independently or in small groups with the instructor's approval, students may use either 2D or 3D tools.

Department of Computer Science

COMPUTER SCIENCE COURSES

CS 180 Operating System I, Man-Machine Interface (3 Cr.)

[Updated: June 2013]

Prerequisite(s): CS 100 or CS 101 & CS 170

This course presents an overview of modern operating systems, in particular Windows and Linux/Unix as implemented on modern PCs. After an overview of what an operating system is and does, the following is also covered: organization and design (the kernel and various subsystems), process management (creation and management of processes and threads, including an introduction to multi-threaded programming), networks (the TCP/IP stack and the organization of the Internet), interprocess communication, process synchronization (locks, semaphores, and methods to avoid deadlocks), memory management (hardware and process views of memory layout and demand-paged virtual memory), file systems, and security and protection (viruses, worms, and Trojan horses).

CS 241 Fundamental Computer Graphics (3 Cr.)

[Updated: January 2013]

Prerequisite(s): Enrollment in the MS in Computer Science program.

This course covers the contents of CS 200 and CS 250 in a single semester. It examines the algorithms and mathematical elements needed to generate and render 2D and 3D scenes. Topics include the graphics pipeline, 2D and 3D coordinate systems and their transformations, homogeneous coordinates and perspective calculations, scan-conversion algorithms, color models, collision detection techniques, and basic culling, clipping, and intersection.

CS 260 Computer Networks I, Interprocess Communication (3 Cr.)

[Updated: July 2013]

Prerequisite(s): CS 180 & CS 225

This course introduces the hierarchical network communication in a distributed computing environment. Course topics cover network technologies, architecture, and protocols. The curriculum gives specific emphasis to the TCP/IP stack and in making students familiar with writing portable socket based software. It prepares students for programming multi-player games in later semesters.

Department of Electrical and Computer Engineering

ELECTRICAL AND COMPUTER ENGINEERING COURSES

ECE 101L Introduction to Engineering Projects (1 Cr.)

Prerequisite(s): None

This course provides an introduction to ECE projects by pairing up students with an engineering team in a monitored environment. Students are assigned a project advisor and placed with a team that is typically enrolled in an upper-division project course. They are exposed to topics, such as the project development process, engineering practices, hardware design techniques, and software implementation issues. Enrollment priority is given to freshmen in the Computer Engineering degree program.

ECE 110 CE 1st Year Project (3 Cr.)

[New: July 2013]

Prerequisite(s): CS 100, CS 100L

This course introduces students to the basics of the Computer Engineering field. This is done by presenting overviews of diverse subjects such as, but not limited to: the history of computer engineering, the electronics development cycle, professional ethics, multidisciplinary team environments, and common development tools used in industry. Students are expected to apply this and previous knowledge to completing a project involving an embedded microprocessor.

ECE 200 Electrical Circuits (3 Cr.)

[Updated: July 2013]

Prerequisite(s): CS 100, CS 100L, MAT 200, PHY 200

This course covers analog circuits. Topics in the course usually include the following: passive components, series and parallel circuits, two-terminal networks, circuit reduction, impedance analysis, waveform measurement, operational amplifiers, passive and active filters, circuit step response, and circuit analysis using Laplace transforms. Integration of analog subsystems into digital circuits is emphasized. Additionally, students are expected to learn how their analog and digital circuit designs are affected by capacitive and inductive effects.

ECE 210 Digital Electronics I (4 Cr.)

[Updated: July 2013]

Prerequisite(s): CS 100, CS 100L

This course focuses on digital circuit design. Topics include combinational and sequential logic, logic families, state machines, timers, digital/analog conversion, memory devices, and microprocessor architecture. Integral to this course are hands-on laboratories where students design, build, and test many of the circuits presented in lecture.

ECE 220L CE 2nd Year Project (3 Cr.)

[Updated: July 2013]

Prerequisite(s): CS 100, CS 100L, ECE 110 or GAM 150, ENG 110

In this course, students are expected to design and build a device using components such as integrated circuits and embedded microprocessors, usually taking the form of a robot or electronic toy. The device interacts with people or the environment, and it demonstrates digital communication. This course introduces concepts of software engineering and process documentation, and emphasizes system-level design. Students are expected to learn the process of creating a device from documenting their concept to building an initial prototype.

ECE 260 Digital Electronics II (4 Cr.)

[Updated: July 2013]

Prerequisite(s): ECE 210

As a continuation of Digital Electronics I, this course has an emphasis on programmable logic. Topics include advanced state machine design techniques and an introduction to hardware description languages (such as Verilog and VHDL). Lectures are reinforced with hands-on laboratory work involving complex programmable logic devices and field programmable gate arrays. Students are expected to complete a final project that utilizes programmable logic design.

ECE 270 Real-Time Operating Systems (3 Cr.)

[Updated: July 2013]

Prerequisite(s): CS 280

In this course, students are introduced to programming for real-time embedded systems. This course covers topics including multi-tasking, synchronization, context switching, scheduling, interrupt handling, application loading, fault tolerance, and reliability testing. Students are expected to implement their own real-time operating system for an embedded microprocessor platform.

ECE 300 Embedded Microcontroller Systems (3 Cr.)

[Updated: July 2013]

Prerequisite(s): CS 170, ECE 220L or CS 260

This course covers topics needed to build the hardware and software for embedded devices. Core topics include microcontroller and microprocessor systems architecture, embedded system standards, and inter-process communication protocols. Additional topics may include: performance measurement, peripherals and their interfaces, board buses, memory interfaces, other modern communication protocols, and system integration.

ECE 310L CE 3rd Year Project I (5 Cr.)

[Updated: June 2013]

Prerequisite(s): ECE 200, ECE 220L, ECE 260, ECE 300, CS 225, PHY 200

In this course, students work in small teams to design, build, program, and test an interactive embedded device. Students integrate a microprocessor with various peripheral devices into a portable embedded platform. Moreover, they are expected to develop team management skills, presentation skills, and critical design processes, as well as study and implement the theory behind human-machine interaction and interface devices.

ECE 350 Control Systems (3 Cr.)

[Updated: July 2013]

Prerequisite(s): MAT 225, MAT 256

This course presents mathematical methods of describing systems, with a focus on linear negative feedback control systems. Topics covered typically include signals and systems, Laplace and Fourier transforms, block diagrams, transfer functions, time-domain modeling, and error and stability analysis. Work is done analytically and numerically with examples from computer, electrical, and aerospace engineering, communications, and mechatronics. Additionally, students are introduced to the implementation of feedback control in embedded systems.

ECE 360L CE 3rd Year Project II (5 Cr.)

[Updated: July 2013]

Prerequisite(s): ECE 310L, CS 280

In this course, students work in small teams to complete a portable interactive embedded device that was started in ECE 310L. Teams are expected to develop a system that integrates software and hardware in a real-time environment. Development includes component selection, design, testing, implementation, and demonstration. Students are expected to provide a framework for applications on the device and to showcase their final project with a simple application.

ECE 410L CE 4th Year Project I (5 Cr.)

[Updated: July 2013]

Prerequisite(s): ECE 360L, CS 330, MAT 225, MAT 256, MAT 258, PHY 270

ECE 410L is the first semester of the CE program capstone project. Students working in teams are expected to develop a system that integrates software and hardware in a real-time environment. Students are responsible for all aspects of the project, including component selection, design, testing, and implementation. In addition to the project work, there will be weekly lectures covering communication and professional skills (e.g., interview preparation, resume/CV writing, presentations) and engineering skills (e.g., engineering management, testing and quality control, statistical methods).

ECE 420 Digital Signal Processing (3 Cr.)

[Updated: July 2013]

Prerequisite(s): MAT 225, MAT 256, MAT 258

This course focuses on signals represented by a sequence of numbers or symbols and the processing of these signals. Topics in this course include continuous, discrete and fast-Fourier transforms, z-transforms, transfer functions, frequency response, finite impulse response, and infinite impulse response filters. Work is done analytically and numerically with examples from

areas such as computer and electrical engineering, communications, and various scientific fields. Additionally, students are introduced to the implementation of digital signal processors in embedded systems.

ECE 460L CE 4th Year Project II (5 Cr.)

[Updated: July 2013]

Prerequisite(s): ECE 410L

ECE 460L is the second semester of the CE program capstone project. Students working in teams are expected to develop a system that integrates software and hardware in a real-time environment. Students are responsible for the project description, component selection, design, testing, implementation, and demonstration. In addition to the project work, there will be weekly lectures covering communication and professional skills (e.g., interview preparation, resume/CV writing, presentations) and engineering skills (e.g., engineering management, testing and quality control, statistical methods).

Department of Fine Arts

ART COURSES

ART 105 Art Processes (3 Cr.)

[New: July 2013]

Prerequisite(s): None

This course provides a basic working knowledge of the processes used in making art. Topics include the origins and techniques involving drawing, tone, color, composition and artistic process as well as a simple overview of art history.

Department of Game Software Design and Production

Game Projects Courses

GAM 152 Project I for Designers (3 Cr.) *[Updated: May 2013]*

Prerequisite(s): CS 116 or CS 120 & CS 120L, GAM 100

Credit may be received for either GAM 150 or GAM 152, not both.

This project focuses on the creation of a simple game or simulation. Students work together on teams of three or four members. All projects are created using a scripting language in a rapid development environment. Topics include effective team communication, planning, documentation, debugging, source control, testing, and iterative software development techniques.

GAM 205 Project II for Designers (4 Cr.)

[New: March 2013]

Prerequisite(s): CS 175, GAM 152, MAT 100

Credit may be received for either GAM 200 or GAM 205, not both.

This project is divided into two semesters and focuses on the creation of a simple real-time game or simulation with 2D graphics (3D games are not allowed in this course). Students will either work in teams made up only of BAGD students or with students from GAM 200. BAGD-only teams may use commercial game engines, middleware, or other libraries that teams with GAM 200 students may not use. Additional topics may include basic software architecture, essential development practices, fundamentals of team dynamics, and task prioritization methods.

GAM 255 Project II for Designers (4 Cr.)

[New: March 2013]

Prerequisite(s): CS 176, GAM 205

Credit may be received for either GAM 250 or GAM 255, not both.

This project is divided into two semesters and focuses on the creation of a simple real-time game or simulation with 2D graphics (3D games are not allowed in this course). Students will either work in teams made up only of BAGD students or with students from GAM 200. BAGD-only teams may use commercial game engines, middleware, or other libraries that teams with GAM 200 students may not use. Additional topics may include basic software architecture, essential development practices, fundamentals of team dynamics, and task prioritization methods.

GAM 300 Project III (5 Cr.)

[Updated: February 2013]

Prerequisite(s): CS 200 or CS 251, CS 260 or CS 245 or CS 365, CS 280, GAM 250, PHY 200

This project is divided into two semesters and focuses on the creation of an advanced real-time game or simulation with hardware-accelerated graphics. BSCS in RTIS students work together on teams of three to five members and implement technical features, such as networking, artificial intelligence, and physics. All projects must be written with a core of C++ code and cannot use middleware, such as pre-existing physics engines, networking engines, etc. Additional topics may include advanced software architecture, 3D art pipelines, building content tools, and advanced team dynamics.

GAM 302 Project III for Designers (5 Cr.)

[Updated: July 2013]

Prerequisite(s): GAT 211, GAM 250 or GAM 252, GAT 251 or CS 280, PHY 115 or PHY 200

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.

GAM 352 Project III for Designers (5 Cr.)

[Updated: April 2013]

Prerequisite(s): GAM 302

Credit may be received for either GAM 350 or GAM 352, not both.

In this class, students work to complete the projects they began in GAM 302. Additional topics may include large project design, advanced testing techniques, internships, and an introduction to resumes and interviews.

GAME DESIGN AND DEVELOPMENT COURSES

GAT 120 Game Analysis (2 Cr.)

[New: March 2013]

Prerequisite(s): None

This course focuses on learning the fundamental design principles of digital games through repeated examination of existing games. Students will be taught how to analyze and reverse-engineer the designs of major works in gaming history, then will analyze a variety of games themselves. Topics may include game mechanics, actions, controls, rewards, punishment, intensity curves, teaching the player, visual aesthetics, and aural aesthetics.

GAT 210 Game Mechanics I (3 Cr.)

[Updated: March 2013]

Prerequisite(s): GAT 110, GAT 120

In this course, students start building a foundational knowledge of game mechanics by creating, analyzing, and testing non-digital dice, card, and board games of their own design. Topics may include randomness, game state, hidden information, positioning, designing to a specification, writing rules, and playtesting.

GAT 240 Technology for Designers (3 Cr.)

[Updated: July 2013]

Prerequisite(s): CS 170 or CS 175, MAT 100 or MAT 140

This course is a survey of the technologies commonly used in game development. Topics may include spreadsheets, file formats, lighting, shaders, art pipelines, networking, databases, physics engines, audio engines, and artificial intelligence. These topics are covered only at a basic level—enough to be able to use them as a designer, but not to the depth they are covered in equivalent CS classes.

GAT 315 3D Game Design I (3 Cr.)

[Updated: March 2013]

Prerequisite(s): GAT 251

Credit may be received for either GAT 315 or for GAT 310, not both.

This course focuses on designing and implementing games using a 3D engine. Students will work to create one or more levels from start to finish, including any needed modifications to game mechanics, controls, and cameras. Topics may include aesthetics, environment building, lighting, texturing, resource placement, player guidance, player controls, camera controls, scripting, and game mechanics in 3D.

GAT 316 3D Game Design II (3 Cr.)

[Updated: March 2013]

Prerequisite(s): ART 310, GAT 315

This course focuses on designing and implementing 3D games in specific genres, such as first-person shooters, adventure games, role-playing games, platformers, or real-time strategy games. Students work to create an original prototype for each genre covered using a 3D engine of the appropriate type. Topics may include puzzle design, platforming design, boss fight design, cover mechanics, and terrain modification for a 3D game.

GAT 330 Interactive Narrative and Character Creation for Games (3 Cr.)

[Updated: March 2013]

Prerequisite(s): ENG 110 & GAT 251

This course focuses on how to write stories that integrate with gameplay and mechanics. From creating characters to writing branching and interactive dialogue, students work on storytelling in various genres by incorporating their stories and characters into an existing game engine. Topics may include the design and structure of dialogue trees, creating mood parameters for dialogue choices, interactive narrative, autonomous behaviors, emergent gameplay, adding emotional depth through the use of character archetypes, and weaving theme and story into the game in a way that resonates with the player.

Department of Humanities and Social Sciences

COLLEGE SUCCESS COURSES

COL 499 Career Search Preparation: Materials, Logistics, and Communication (1 Cr.)

[New: May 2013]

Prerequisite(s): None

College 499 is a capstone course for students to prepare their job application materials and learn how to effectively search for an entry-level job in their field. The goal of the course is for each student to have a polished resume, cover letter, business card, and online/web presence by the end of the semester, as well as a search strategy for seeking employment.

ECONOMICS COURSES

ECN 100 Introduction to Economics (3 Cr.)

[New: March 2013]

Prerequisite(s): None

This course introduces the fundamentals of micro- and macroeconomics. Topics may include supply and demand, competition, market efficiency, auctions, barter, monopolies, externalities, welfare, unemployment, growth, inflation, interest rates, exchange rates, and budget deficits.

Department of Mathematics

MATHEMATICS COURSES

MAT 105 Introductory Probability and Statistics (3 Cr.)

[New: March 2013]

Prerequisite(s): None

This course presents fundamentals of probability and statistics without calculus. Topics include: data representation, population mean, variance, and standard deviation, finite probabilities, events, conditional and marginal probability, discrete random variables, binomial distribution, normal distribution, sampling distributions for mean and variance, estimation of means, confidence intervals, hypothesis testing, inference, and chi-square tests.

Department of Music

MUSIC COURSES

MUS 115 Fundamentals of Music and Sound Design (3 Cr.)

[New: May 2013]

Prerequisite(s): None

This course offers an introduction to the fundamentals of music and sound design, and an overview of the production of music and sound for animation, film, and video games. Topics include music notation, key, meter, rhythm, melody, harmony, texture, tempo, genre and form; historical musical styles; dialog and timing; and digital audio production methods and techniques.