
**Redmond, Washington**
**U.S.A.**

**CATALOG FOR THE ACADEMIC YEAR**

# 2010-2011

Updated: August 18, 2009

# Notices

**Authorization**
DigiPen Institute of Technology is authorized by the Washington State Higher Education Coordinating Board (HECB) and meets the requirements and minimum educational standards established for degree-granting institutions under the Degree Authorization Act. This authorization is valid until May 15, 2010*, and authorizes DigiPen Institute of Technology to offer the following degrees:

- **Bachelor of Arts in Game Design**
- **Bachelor of Fine Arts in Production Animation**
- **Bachelor of Science in Game Design**
- **Bachelor of Science in Computer Engineering**
- **Bachelor of Science in Real-Time Interactive Simulation**
- **Master of Science in Computer Science**

Any person desiring information about the requirements of the Act or the applicability of these requirements to the Institute may contact the HECB by mail at P.O. Box 43430, Olympia, WA 98504-3430, or by calling (360) 753-7800.

*DigiPen Institute of Technology has been authorized since 1996 and strictly adheres to the biennial authorization renewal process.

**Accreditation**
DigiPen Institute of Technology is accredited by the Accrediting Commission of Career Schools and Colleges of Technology (ACCSCT). The ACCSCT is listed by the U.S. Department of Education as a nationally recognized accrediting agency.

**Copyright Notice**


**Trademarks**


**Important Notices**
All items including, but not limited to, application forms, transcripts, reference letters, resumes, software, and any accompanying documentation or works of art (collectively "the Items"), forwarded to DigiPen by any person (the "Sender") whether at the request of DigiPen or otherwise, become the exclusive property of DigiPen unless otherwise agreed to in writing by DigiPen, and the Institute** shall be under no obligation whatsoever to return the Items to the Sender. At DigiPen's discretion, the Items may be destroyed after being reviewed.

DigiPen Institute of Technology reserves the right to make changes to the curricula and calendar without any prior notice.

The course offerings and requirements of DigiPen Institute of Technology are under continual examination and revision. This catalog is not a contract; it merely presents the offerings and requirements in effect at the time of publication and in no way guarantees that the offerings and requirements will not change. The Institute specifically reserves the right to change requirements for any major during any particular year. The individual student assumes full responsibility for compliance with all current academic requirements. Current course offerings may be obtained from the Office of the Registrar. Current major and degree requirements may also be obtained from the Office of the Registrar. For the most current information, visit DigiPen's official course catalog online at *www.digipen.edu/academics/course-catalog*.

*** Please note that "Institute" (when used in this book) means "DigiPen Institute of Technology."*

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# 2010-2011

# General Information

**Name of the School**
DigiPen Institute of Technology

**Contact Information**
DigiPen Institute of Technology
5001 - 150th Ave. NE, Suite #210
Redmond, WA USA 98052

Telephone: (866) 478-5236 or (425) 558-0299
Facsimile: (425) 558-0378

Email: *info@digipen.edu*
Web: *www.digipen.edu*

**Degree Authorization**
DigiPen Institute of Technology is authorized by the Washington State Higher Education Coordinating Board (HECB) and meets the requirements and minimum educational standards established for degree-granting institutions under the Degree Authorization Act. This authorization was first received in 1996. HECB authorizes the DigiPen Institute of Technology to offer the following degree programs:

- **Bachelor of Science in Real-Time Interactive Simulation**
- **Bachelor of Science in Computer Engineering**
- **Bachelor of Science in Game Design**
- **Bachelor of Arts in Game Design**
- **Bachelor of Fine Arts in Production Animation**
- **Master of Science in Computer Science**

Any person desiring information about the requirements of the Act or the applicability of those requirements to the Institute may contact the HECB office at P.O. Box 43430, Olympia, WA 98504-3430.

**Accreditation**
Effective November 2005, the Commission granted DigiPen Institute of Technology renewal of accreditation effective for a period of five years.* On June 6, 2006, the Commission granted accreditation for DigiPen's Master of Science in Computer Science degree program. Under the guidelines set by the Accrediting Commission of Career Schools and Colleges of Technology (ACCSCT), DigiPen Institute of Technology is an accredited college. Additionally, DigiPen's satellite art campus in Redmond is accredited by the ACCSCT as a satellite location of the Institute's main campus. Accreditation is a voluntary system of non-government, self-regulation of the nation's education institutions. Through the accrediting process, institutions and their programs are evaluated and recognized for quality education. This recognition is extended through national, specialized, or regional accrediting agencies who themselves are recognized by the U.S. Department of Education.

Accreditation is a formal status that is granted to an institution that meets or exceeds stated educational quality criteria. The purposes of accreditation are to assess and enhance the educational quality of an institution, to assure consistency in institutional operations, to promote institutional improvement, and to provide for public accountability.

DigiPen Institute of Technology has been accredited by the ACCSCT since 2002. By becoming an accredited institution, DigiPen has joined in partnership with other educators and institutions committed to providing programs of quality and to conducting their affairs with honesty, integrity, and dignity. DigiPen takes this responsibility seriously and proudly embraces accreditation as a means of continuous self-analysis and achievement of its educational mission and goals.

**The Institute strictly adheres to a timely preparation for its periodic renewal of accreditation responsibilities.*

**History of DigiPen**

In 1988, Mr. Claude Comair founded DigiPen Corporation in Vancouver, B.C., Canada, as a computer simulation and animation company and undertook commercial projects. As the demand for production work grew, DigiPen faced the difficulty of finding qualified personnel, and in 1990 it began offering a dedicated training program in the area of 3D computer animation. In early 1990, building on the success and educational experience of preparing numerous students for careers in 3D computer animation production, DigiPen approached Nintendo of America to work together to establish a post-secondary program for those interested in programming video games. With the demand for qualified personnel growing and no other school in North America offering such a dedicated program, Nintendo was very supportive of the idea. The result of this collaborative effort was that in 1994 DigiPen Applied Computer Graphics School officially accepted its first class of video game programming students to its campus in Vancouver, B.C., 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 diploma program and graduated four student cohorts over the following four years.

While DigiPen graduates quickly found employment in the industry, video game consoles were transforming into more complex, sophisticated computers; DigiPen realized there was a need to offer a bachelor degree-level program dedicated to the interactive computing industry. Based on their expertise and experience, DigiPen engineers developed a four-year degree curriculum, which they submitted to the Washington State Higher Education Coordinating Board (HECB) for authorization. In 1996, the HECB granted DigiPen the authorization to award Associate and Bachelor of Science Degrees in Real-Time Interactive Simulation, the world's first bachelor degree program dedicated to computer/video game development. After two years of getting the logistics in place, in 1998, DigiPen opened DigiPen Institute of Technology in Redmond, Washington, U.S.A.

In 1999, DigiPen added to its degree-program offerings the Associate of Applied Arts in 3D Computer Animation. At this time, DigiPen phased out its educational activities in Canada, and the Redmond campus became the only DigiPen educational facility. The first graduation ceremony took place on July 22, 2000, when DigiPen awarded degrees to six graduates of the Associate of Science program and to five graduates of the Bachelor of Science program. DigiPen Institute of Technology in Redmond, WA, received accreditation from the Accrediting Commission of Career Schools and Colleges of Technology in 2002.

In the fall of 2004, DigiPen added the following degree programs:

- **Bachelor of Science in Computer Engineering**
- **Bachelor of Fine Arts in Production Animation**
- **Master of Science in Computer Science***

In the fall of 2008, DigiPen began offering the following degree programs:

- **Bachelor of Science in Game Design**
- **Bachelor of Arts in Game Design**

With around 900 students registered, DigiPen continues to strive for the highest standard of education demanded by the industry and continues to be a leader in the field of digital interactive entertainment education. Throughout the years, DigiPen students have excelled and won awards in national and international video game competitions. DigiPen is the only educational institution whose students have received an award in the Main Competition of the International Games Festival (IGF), a competition for professional-level companies and a highlight of the Game Developers Conference. In 2004, 2005, 2006, 2007, and 2008, a group of professional game developers selected DigiPen student games above other professional games to represent the best of a given year. In 2004, *Bontago* won the "Innovation in Game Design" award, surpassing four professionally developed titles. Additionally, DigiPen students have placed the largest number of student projects in the Independent Games Festival

student showcase every year since it began, with a seven-year total of 23 winning game projects. Since the award's inception in 2007, a DigiPen student game has won the title of "Best Student Game"at the IGF every year. Other competition highlights for students from the Institute include winning at the Slamdance Guerilla Game Awards and being selected as finalists at IndieCade.

In fall 2008, DigiPen opened its first international branch campus in Singapore, the prosperous island city-state between Malaysia and Indonesia. In cooperation with Singapore's Economic Development Board, DigiPen's new campus is located in an area called "One-North," an ambitious live-work project that connects information technology, communication, and media industries. Students in the first cohort at this campus will be taking one of the following degree programs:

- **Bachelor of Science in Real-Time Interactive Simulation**
- **Bachelor of Fine Arts in Production Animation**

Students at DigiPen's Singapore campus will experience the same rigorous education as their Redmond counterparts and will be poised to take advantage of the rapidly growing Asian digital media sector.

With the ongoing success of DigiPen's U.S. campus plus its new campus in Singapore, DigiPen continues to strive for the highest standard of education demanded by the industry and is considered a leader in the field of digital interactive entertainment education.

**ACCSCT granted approval for this degree in 2006.*

**Continuing Education Program**

Authorized by the Washington Workforce Training Board to grant Continuing Education Units, DigiPen Institute of Technology offers a series of continuing education courses each semester and during the summer session. These courses are for individuals looking to explore the world of digital interactive entertainment production or to enhance their overall knowledge in game development topics such as programming, production art, and game design. Courses are taught at DigiPen's Redmond campuses and some are also offered online. Please visit *www.digipen.edu/academics/continuing-education/* for more information about specific courses being offered, cost, admissions information, and registration.

***Please note that the continuing education courses are not transferable to any of DigiPen's degree programs.***

**DigiPen Outreach**

In addition to its post-secondary degree programs, DigiPen offers opportunities for primary and secondary students to learn about the process of video game and 3D animation production. Now branded as part of DigiPen's ProjectFUN Initiative, DigiPen has several programs, which support art, science, and math education.

*ProjectFUN Workshops*

Since 1994, DigiPen has been offering highly engaging one-week and two-week workshops that give students a first taste of what is involved with programming games, producing 3D animations, and working with robotic vehicles. These workshops are taught at DigiPen's Redmond, WA, campus during the summer and are also offered across the U.S.A. as well as in Canada, Jamaica, New Zealand, and Norway.

*ProjectFUN Technology Academies*
In 2000, DigiPen began teaching a computer science program in the U.S.A. for junior and senior high school students who are interested in taking a serious computer science program. There are currently ProjectFUN Technology Academy sites in Washington, other states, and foreign countries. Starting Fall 2007, DigiPen began offering an online version of the Technology Academy to students in Washington State. This online program now includes students from across the nation.

*ProjectFUN Online*
In May 2006, DigiPen launched its newest outreach effort, taught live online by DigiPen instructors. This allows students to participate in this program year-round from the comfort of their own homes and communities. The content is similar in nature to that taught in the workshops and is another option for those unable to attend a workshop.

**Mission of Institution**
The mission of DigiPen Institute of Technology is to offer higher education to those who would like to pursue studies and careers in fields of interactive computer technologies, which include graphics and real-time interactive simulation, and provide highly qualified personnel to the interactive computer industries to sustain their growth and productivity.

**Notice of Non-Discrimination**
DigiPen Institute of Technology is committed to maintaining a diverse community in an atmosphere of mutual respect and appreciation of differences.

DigiPen Institute of Technology does not discriminate in its educational and employment policies on the basis of race, color, creed, religion, national/ethnic origin, sex, sexual orientation, age, or with regard to the basis outlined in the Veterans' Readjustment Act and the Americans with Disabilities Act.

**Student Right to Know Act & Campus Crime Act Disclosure Notice**
In compliance with the Higher Education Act of 1965 and the Student Right to Know Act, DigiPen is please to provide copies of the graduation rates and campus crime reports to prospective and current students upon request. Please send a written request to the Admissions Office (*admissions@digipen.edu*) or Registrar's Office (*registrar@digipen.edu*) to have copies of either report sent to you.

**Program of Studies Offered**
Currently, the Institute offers the following degree programs:

- **Bachelor of Science in Real-Time Interactive Simulation**
- **Bachelor of Science in Computer Engineering**
- **Bachelor of Science in Game Design**
- **Bachelor of Arts in Game Design**
- **Bachelor of Fine Arts in Production Animation**
- **Master of Science in Computer Science**

**About DigiPen's Facilities**
DigiPen's main campus (5001 - 150th Ave. NE, Suite #210, Redmond, WA 98052) encompasses over 52,000 square feet with a library, lunchroom, and auditorium; dedicated computer labs for each program of students; as well as additional classrooms for lectures and instruction. The main campus is home to DigiPen's science degree programs.

DigiPen's satellite art campus (8273 154th Ave. NE, Redmond, WA 98052) is located two miles from the main campus. This is where Bachelor of Fine Arts in Production Animation degree program is taught. This location is approximately 22,000 square feet and has a lecture hall and a combination of computer labs and art studios. Weekly student access to the DigiPen campuses is from 7:30 A.M. to midnight, Monday through Friday, and from noon to 8 P.M. on Saturday and Sunday. Core office hours for the Administration staff run from 8:00 A.M. to 5:00 P.M. (main campus) and 9:00 A.M. to 5:00 P.M. (art campus), Monday through Friday, with additional hours as needed.

Major equipment items include microphones and LCD projection systems in many of the classrooms. Various presentation formats are also available, including DVD players, VCRs, document cameras, and CD players. The majority of the student computers currently range from Pentium 4 3.0 GHz systems with 1GB RAM to Core2 duo - 3GHz systems with 2GB RAM. All computers are on an internal network and have access to printers, servers, and archival media. DigiPen upgrades the computer equipment on a periodic basis.

DigiPen classrooms vary in size from lecture halls accommodating 120 students to small classrooms of 20 students.

**Description of the Library Facilities and Internet Access**

*Library Services*

DigiPen's library aims to support the Institute's curriculum, students, and faculty. Students have access to a variety of resources like 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 1,600 square-foot library on our main campus currently holds over 2,500 books, subscriptions to over 50 different magazines and more than 120 console and computer games. DigiPen's satellite art campus includes a 400 square-foot library, which supports the needs of the B.F.A. students. Located in the dedicated computer labs, over 500-networked computers form an integral part of the library's resources available to students. 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.

*Internet Access*

Internet access is a regulated service and is provided for students free of charge. Students may lose this privilege if they do not abide by the *Computer and Network Usage Policy*.

# Important Dates 2010-2011

**Institutional Calendar**

| | | |
|---|---|---|
| **August 30-Sept. 3, 2010** | Orientation - First Year Students | |
| **September 6, 2010** | Labor Day | No Classes |
| **September 7, 2010** | Classes Begin - Fall Semester | |
| **November 11, 2010** | Veterans' Day | No Classes |
| **November 25-28, 2010** | Thanksgiving | No Classes |
| **December 13-17, 2010** | Fall Semester Final Exams | |
| **December 17, 2010** | Fall Semester Ends | |
| **December 18, 2010-Jan. 9, 2011** | Winter Break | No Classes |
| **January 3-7, 2011** | Intersession | No Classes |
| **January 10, 2011** | Classes Begin - Spring Semester | |
| **January 17, 2011** | M.L. King Day | No Classes |
| **February 3, 2011** | Founder's Day | No Classes |
| **February 21, 2011** | Presidents' Day | No Classes |
| **March T.B.A., 2011** | Spring Break | No Classes |
| **April 25-29, 2011** | Spring Semester Final Exams | |
| **April 29, 2011** | Spring Semester Ends | |
| **May 2-May 6, 2011** | Intersession | No Classes |
| **T.B.A., 2011** | Commencement | |
| **May 9, 2011** | Classes Begin - Summer Session | |
| **May 30, 2011** | Memorial Day | No Classes |
| **July 4, 2011** | Independence Day | No Classes |
| **July 25-29, 2011** | Summer Session Final Exams | |
| **July 29, 2011** | Summer Session 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**

| | |
|---|---|
| **July 1, 2010** | Tuition deposit due for Fall 2010 Semester |
| **August 1, 2010** | Tuition balance due for Fall 2010 Semester |
| **September 13, 2010** | Last day to add classes for Fall 2010 Semester<br>Withdrawal deadline for 90% refund |
| **September 17, 2010** | Automatic withdrawal date from classes missing prerequisites<br>Final day to drop classes without academic penalty |
| **October 1, 2010** | Tuition deposit due for Spring 2011 Semester |
| **October 3, 2010** | Withdrawal deadline for 75% refund |
| **October 28, 2010** | Final day to receive a "W" on transcript for Fall 2010 Semester withdrawals, 50% refund<br>Withdrawals from the Institute after this date will receive "F" grades on transcript<br>Final day to drop a class |
| **December 1, 2010** | Tuition balance due for Spring 2011 Semester |
| **January 16, 2011** | Last day to add classes for Spring 2011 Semester<br>Withdrawal deadline for 90% refund |
| **January 21, 2011** | Final day to drop class without academic penalty |
| **February 5, 2011** | Withdrawal deadline for 75% refund |
| **March 2, 2011** | Final day to receive a "W" on transcript for Spring 2011 Semester withdrawals, 50% refund<br>Withdrawals from the Institute after this date will receive "F" grades on transcript<br>Final day to drop a class |
| **April 1, 2011** | Tuition balance due for Summer 2011 Session |
| **July 1, 2011** | Tuition deposit due for Fall 2011 Semester |
| **August 1, 2011** | Tuition balance due for Fall 2011 Semester |

# Tuition and Fees

*All tuition and fees are in U.S. dollars.*

**Enrollment Application Fee**

A $35.00 application fee must accompany the application form. The application fee is refundable if the applicant is not accepted to the Institute or if the applicant requests a refund within three days after submitting the application fee and cancels his or her application.

**Registration Fee**

Upon acceptance into a degree program, a $150.00 registration fee must be paid to confirm enrollment. If a student cancels his or her enrollment, he or she may request a refund of the registration fee within three days after signing the enrollment agreement and making an initial payment.

**Tuition Fee Payment**

Please see the payment schedule in the Student Enrollment Agreement for dates and amounts due. The payment of tuition and all associated fees is the sole responsibility and obligation of the registering student. Tuition increases will be announced six months before taking effect.

**Washington State Residency Policy**

As of July 1, 2003, Washington State law changed the definition of "resident student." The law makes certain students, including international students, eligible for resident student status - and eligible to pay resident tuition rates - when they attend public colleges and universities in this state. Although DigiPen Institute of Technology is a private college, it will honor this law under the same terms and conditions. Please note that the law does not make students eligible to receive need-based state or federal financial aid. To qualify for resident status, students must meet the following conditions and complete an affidavit/declaration/certification form found at *www.hecb.wa.gov/research/issues/documents/ResidencyCertForm1079May2008.pdf.*

1. Resided in Washington State for three years immediately prior to receiving a high school diploma, and completed the full senior year at a Washington high school; or

2. Completed the equivalent of a high school diploma and resided in Washington State for the three years immediately before receiving the equivalent of the diploma; or

3. Continuously resided in the State since earning the high school diploma or its equivalent.

Students must submit the original copy of the completed affidavit to the Admissions Office or the Registrar's Office to which they are applying or attending. Faxed or emailed forms, or forms without an original signature, are not acceptable.

On April 1, 2009, DigiPen began accepting the Washington affidavit form, and the effect of the affidavit will begin September 1, 2009. This means that the affidavit will affect all tuition payable beginning September 1, 2009.

**Late Registration Fee**

Students are responsible for registering for courses and re-registering for courses that need to be retaken each semester by the posted date. All late class registrations will cost an additional $100.00 to cover administrative fees.

**Books**

Text and reference books are estimated to be approximately $900.00 per year. This cost is not included as a part of the tuition.

**Laptops**

In order to further enhance our collaborative production environment, DigiPen Institute of Technology will begin to transition to a laptop teaching model in the fall of 2010. All first-year students entering the real-time interactive simulation (B.S.), computer engineering (B.S.), and game design (B.A. and B.S.) degree programs, will be required to have a suitable laptop in the fall of 2010. First-year students in the production animation (B.F.A.) program will not be required to purchase laptops until they enter their second year of the program in the fall of 2011. Students entering DigiPen's Master of Science in Computer Science degree program will also be required to have a suitable laptop for fall 2010. Currently enrolled students are not required to own laptops, but are encouraged to do so. Those who do not own laptops with the minimum specifications will need to purchase one and can do so through recommended vendors who have pre-configured laptops available for purchase. The minimum laptop specifications will be provided for those who wish to configure their own laptop.

Further details regarding specifications, technical support requirements, software requirements, and purchase options can be found on DigiPen's website at *www.digipen.edu*.

**Parking**

On-campus parking is available for $480.00 per academic year. Please see the Administration Office for details regarding parking applications.

**Administrative Fee**

This fee covers a limited number of transcript requests, add/drop requests, enrollment verifications, and re-registrations. This fee is $40.00 per semester for all students.

**Tuition**

| | Undergraduate U.S. Citizen & U.S. Resident | Undergraduate Non-U.S. Citizen or Non-U.S. Resident | Graduate U.S. Citizen & U.S. Resident | Graduate Non-U.S. Citizen or U.S. Resident |
|---|---|---|---|---|
| **Cost/Credit** | $515.00* | $621.00* | $658.00* | $814.00* |
| **Total Cost B.S. in R.T.I.S. & B.S. in C.E.** | $79,310.00* (154 credits) | $95,634.00* (154 credits) | N/A | N/A |
| **Total Cost B.S. in G.D.** | $75,705.00* (147 credits) | $91,287.00* (147 credits) | N/A | N/A |
| **Total Cost B.A. in G.D.** | $73,130.00* (142 credits) | $88,182.00* (142 credits) | N/A | N/A |
| **Total Cost B.F.A.** | $74,160.00* (144 credits) | $89,424.00* (144 credits) | N/A | N/A |
| **Total Cost M.S. in C.S.** | N/A | N/A | $24,346.00* (37 Credits) | $30,118.00* (37 Credits) |

**Tuition is subject to change with six months notice.*

*Students re-registering for a course that needs to be retaken must pay the regular course fees and are responsible for re-registering in the course.*

*Students auditing a course must pay the regular course fees.*

**Technology Fee**
This fee covers supplies and maintenance costs for the students' use of equipment and upkeep of the computer labs. This fee is $40.00 per semester for all students.

**Graduation Fee**
This $75.00 fee covers the cost of processing the graduation application. This fee must accompany the graduation application.

**Cap-and-Gown Fee**
Students attending the graduation ceremony are required to pay $25.00 for their cap and gown. This is in addition to the Graduation Fee.

**Transfer and Waiver Fees**
Course transfers and waivers are processed at $25.00 per credit.

**Course Fees**
Some courses may require lab or material fees. Please refer to course descriptions on course registration forms.

**Additional Courses**
Students registered in an undergraduate degree program at DigiPen may register for graduate-level classes. Tuition for these credits will be assessed at the undergraduate rate.

*Note: Please refer to the Master in Science in Computer Science degree program section for more information about transfer credits at the graduate level.*

# Cancellation and Refund Policies 2010-2011

**Tuition Refund Schedule**
*Cancellation Policies*

a. Applicants who have not visited the school prior to enrollment will have the opportunity to withdraw without penalty within three business days following either the regularly scheduled orientation procedures or a tour of the school facilities and inspection of equipment where training and services are provided.

b. All monies paid by an applicant who withdraws will be refunded, if requested, within three days after signing an enrollment agreement and making an initial payment. An applicant requesting cancellation more than three days after signing an enrollment agreement and making an initial payment, but prior to entering the school, is entitled to a refund of all monies paid minus a registration fee of $150.

A student who submits an official withdrawal in writing or who is determined by the Administration to have withdrawn from the Institute:

- Before the beginning of classes: Student will be entitled to a tuition refund of all money paid towards tuition for the upcoming semester.
- Before the close of the seventh calendar day after the beginning of classes: Student must pay 10% of the semester's tuition. Any portion of tuition paid over this amount will be refunded.
- Before the close of the 27th calendar day of the semester: Student must pay 25% of the semester's tuition. Any portion of tuition paid over this amount will be refunded.
- Before the close of the 52nd calendar day of the semester: Student must pay 50% of the semester's tuition. Any portion of tuition paid over this amount will be refunded.

- After the 52nd calendar day of the semester: Student must pay 100% of the semester's tuition.

Except for the registration fee, all other assessed fees are refunded on the same schedule as tuition payments.

#### Tuition Account Reimbursement

*Reimbursement Requests*

Except for excess Title IV federal funds, any credit balance left on a student account is applied to future charges unless the student requests a reimbursement check by signing a Reimbursement Request Form. Excess Title IV federal funds are automatically released to the student and/or parent borrower under federal student aid regulations.

*Reimbursement Check*

A reimbursement check is made payable to the student, unless otherwise instructed by him or her on the Reimbursement Request Form. Checks may be picked up from the Main Office or mailed to the address specified on the Reimbursement Request Form. Given that the account carries a reimbursable credit balance at the time of request, a reimbursement check is issued two to four weeks of the date that the request was received.

*Inactive Student Accounts*

Any credit balance left on a student account that becomes inactive through graduation, withdrawal, or any other event is automatically reimbursed to the student within 60 days of the account's change of status. The reimbursement is made in the form of a check and is mailed to the student's last-known billing address. If a student wishes to have the credit balance returned to a lender of a federal or alternative student loan, the student must complete the appropriate paperwork with the Financial Aid Office at the time of graduation or withdrawal from the Institute.

#### Termination Date

The termination date for refund purposes for institutional withdrawal is the last date of actual attendance at the Institute by the student. The termination date for refund purposes for withdrawal from individual classes is the date of receipt of the appropriate withdrawal form. Notice of cancellation or withdrawal should be given by completing the appropriate withdrawal form, whether it is withdrawal from the Institute or from specific classes for which the student is registered.

If the student's account remains delinquent for over 30 days, the Institute reserves the right to cancel the student's registration.

#### Special Cases

In the documented event of prolonged illness or accident, death in the family, or other special circumstances that make it impractical to complete the program in which the student is enrolled, the Institute shall make a settlement that is reasonable and fair to both parties. These will be determined on a case-by-case basis.

#### Application of Policy

Any monies due to the student shall be refunded within 60 days from the last date of the student's attendance or within 60 days from the date of receipt of payment, in the event that the date of such receipt is after the student's last date of attendance.

If a student's financial obligation is not fulfilled, the Institute is authorized to do the following until the owed monies are paid:

- Withhold the release of the student's academic records or any information based upon the records.
- Withhold the issuance of the student's transcripts.

# Financial Assistance

### The Role of the Financial Aid Office

The Financial Aid Office assists students and their parents in meeting basic educational costs. Its goal is to deliver student assistance in a timely manner and to seek financial aid availability for those who qualify.

The primary objective of the Financial Aid Office is to provide adequate financial assistance to the maximum number of eligible students through coordination with and full utilization of all governmental, community, and on-campus resources. DigiPen administers all financial aid programs in accordance with established state, federal, and institutional regulations and policies. Please contact the Financial Aid Office or visit *www.digipen.edu* for the most up-to-date eligibility criteria and award amounts for the aid programs outlined in this catalog.

The Financial Aid Office endeavors to fully fund students to the maximums provided under the law and strives to eliminate unnecessary steps by simplifying the aid process. The Financial Aid Office attempts to provide individualized services to students. It also provides intervention and liaison support when necessary to resolve problems related to an individual student's award. Additionally, DigiPen takes a proactive approach to default management and prevention by performing an active role in student loan counseling and delinquency notification procedures.

The U.S. Department of Education has designated DigiPen Institute of Technology as an eligible institution for participation in the following programs:

### Federal Pell Grant Program

Federal Pell Grants are the largest source of free government money for college students. These need-based grants are awarded to every undergraduate student who qualifies and has not already earned a bachelor's degree, master's degree, or other professional degree. Grants can be used for tuition, fees, and living expenses. The amount a student may receive depends on the financial situation of the student's family and the student's enrollment status.

### Academic Competitiveness Grant Program (ACG)

The ACG is available for undergraduate students who may qualify for a Federal Pell Grant and who have successfully completed a rigorous high school program, as determined by the state or local education agency and recognized by the Secretary of Education. The amount of a student's ACG, in combination with his or her Federal Pell Grant, other resources, and estimated financial assistance, may not exceed his or her financial need (cost of attendance minus the Expected Family Contribution equals financial need). A student may not receive more than one ACG award in each academic year for which he or she is eligible.

### National SMART Grant Program

A national Science and Mathematics Access to Retain Talent (SMART) Grant is only available for third- and fourth-year undergraduate students who are eligible for a Federal Pell Grant. Recipients must also be enrolled in the courses necessary to complete the degree program and meet the requirements of their intended major, in addition to maintaining a cumulative grade point average of at least a 3.0. The amount of a student's SMART Grant, in combination with his or her Federal Pell Grant, other resources, and estimated financial assistance may not exceed his or her financial need (cost of attendance minus the Expected Family Contribution equals financial need). A student may not receive more than one SMART Grant award in each academic year for which the student is eligible.

#### Washington State Need Grant Program (WSNG)

Washington State Need Grants (WSNG) are awarded to every undergraduate student who qualifies. WSNG recipients agree that the Higher Education Coordinating Board (Washington State agency that issues the grant) and DigiPen Institute of Technology reserve the right to withdraw, reduce, or modify the grant due to funding limitations or due to changes in circumstances, which will affect the student's eligibility for the WSNG. To be eligible you must:

- Be a U.S. citizen.
- Domicile in the State of Washington: be a resident of the State of Washington.
- Provide documentation of residency verification (If dependent: one from student, and two from parent; if independent: two from student). For required verification, please visit, call, or email the Financial Aid Office.
- Meet satisfactory academic progress (SAP) requirements. Note: the SAP requirements for WSNG recipients are set forth and approved by the State of Washington; these are different than the Institute's satisfactory progress policy.
- Be enrolled at least as a half-time (6-11 credits) student.
- Apply using the FAFSA and DigiPen Financial Aid Application.
- Not owe a repayment to the WSNG or any other student aid program.
- Not have exceeded either of the following limits: A) ten semesters of WSNG use, B) 125% of the published length of your program.
- Not be pursuing a degree in theology.

#### Federal Family Educational Loan Programs (FFELP)

The FFELP offers long-term loans, which allow students to postpone paying for a portion of their school expenses until after they graduate or leave school. Repayment begins six months after completion or withdrawal from the degree program. The following loan programs fall under the umbrella of these programs: the Federal Subsidized Stafford loan program for undergraduate and graduate students, the Federal Unsubsidized Stafford loan program for undergraduate and graduate students, the Federal Parent Loan for Undergraduate Students (PLUS), and the Federal Grad PLUS loans for graduate students.

#### Federal Stafford Loans

DigiPen participates in the Stafford Loan Program. These loans are the most common ones used by students, and they are for undergraduate and graduate students. There are two types: Subsidized loans, for which the government pays the interest while you are in college; and Unsubsidized loans, for which you are responsible for paying all the interest on the loans, during college and after. You may receive both types of loans at the same time. The U.S. Department of Education and the loan guarantor charge an origination fee for both Subsidized and Unsubsidized Stafford Loans. To receive loan funds, you must be enrolled at least as a half-time student.

#### Subsidized Federal Stafford Program

Subsidized Stafford Loans are awarded based on demonstrated financial need. For these loans, the federal government pays the interest while you are in college and during the six-month grace period after you graduate, leave school, or enroll as less than a half-time student. The government also pays your interest costs during deferment. A student will be obligated for an origination fee on each Subsidized Stafford Loan he or she receives. To qualify, you must meet all the requirements for federal student financial aid. Repayment terms may vary from lender to lender.

#### Unsubsidized Federal Stafford Program

Unsubsidized Stafford Loans are for all eligible students, regardless of their income and assets. You must meet the same requirements as those for the Subsidized Stafford Loan, except for demonstrating financial need. You are responsible for paying all the interest on the loan, but you can allow it to accumulate while you are in college and during the grace period. If you do, the interest will be added to the amount you borrowed when repayment begins and future interest will be based on the higher loan amount. The maximum interest rate on an Unsubsidized Federal Stafford Loan is 8.25%. The interest rates on these loans may change so the student must check with a lender or the Institute for the current rate. Borrowing students will be obligated for an origination fee on each Unsubsidized Federal Stafford Loan they receive, so they must check with a lender or the Institute for the current cost of this fee.

#### Federal PLUS Loan Program

The Federal Parent Loan for Undergraduate Students (PLUS loans) enables parents or stepparents to borrow up to the total cost of their dependent child's education, minus any other aid he or she may receive. PLUS loans are for undergraduate study only and are not based on your family's income or assets. Federal PLUS loan borrowing is limited to parents and guardians with a favorable credit history. These loans are always unsubsidized. The maximum interest rate for a Federal PLUS loan is 9%. The interest rates charged on these loans may change, so borrowing students must check with a lender or the Institute for the current rate. Parents will be obligated for an origination fee on each Federal PLUS loan they receive. In-school deferment of payment is an option. Check with your lender or the Institute for more information.

#### Graduate PLUS Loans

Graduate PLUS loans are available to graduate students, offering another option for financing a college education. The Graduate PLUS loan offers several benefits:

- In-school deferment: students can delay payments until they have graduated.
- Easy credit eligibility requirements.
- Wide availability, since they are federally guaranteed.

The maximum interest rate for a Graduate PLUS loan is 9%. The interest rates charged on these loans may change, so borrowing students must check with a lender or the Institute for the current rate. Students will be obligated for an origination fee on each Graduate PLUS loan they receive. Borrowing students must check with a lender or the Institute for the current cost of this fee.

#### Other Loans

Other financial aid options include private bank loans. Also known as alternative loans, private loans can help you pay for college if you are still short after exhausting all your resources, federal loans, and other college financial aid. Private loans usually carry higher interest rates and fees than federal loans and typically are based on creditworthiness. A number of commercial lenders offer private loans.

#### Scholarship Information

Scholarships are one form of financial assistance to help students pay for college. It is a good idea to check with employers and local civic groups to see if scholarship opportunities exist. Additionally, many community organizations, foundations, religious organizations, and professional and trade associations offer scholarships. Scholarships may be listed in magazines or on websites devoted to your interests or skills. Start your research with the local organizations in your community, and then browse the scholarship directories on the Internet or in the libraries. Also contact the personnel offices of companies in your area or of your parents' employers or labor unions to see if they offer scholarships. You may need to write letters and essays or be interviewed as part of the application process, so start your research early.

Private organizations will notify you directly of an award, its requirements, and how you will receive the funds. Keep in mind that colleges must apply any outside scholarship toward your unmet need or reduce other aid - scholarship dollars usually will not replace your Estimated Family Contribution. DigiPen will reduce loan aid rather than grant aid. Be sure to let DigiPen know about any outside awards as soon as you receive them. You can apply for private scholarships and grants throughout your college years.

DigiPen Institute of Technology also offers a number of scholarships to students, and only DigiPen students and applicants are eligible to receive these awards. These scholarships are resources available to qualified students that meet exceptional criteria. A limited number of scholarships are available each year, and interested students are urged to apply at the beginning of the year. The application deadline for all scholarships is April 1.

Please search *www.digipen.edu* periodically for an up-to-date list of scholarships being offered and for additional information regarding eligibility, selection criteria, and amounts.

#### Veterans Affairs Benefits

The Higher Education Coordinating Board's State Approving Agency (HECB/SAA) has approved DigiPen's academic programs for enrollment of persons eligible to receive Veterans Affairs (VA) educational benefits. The following VA educational assistance benefits are available at DigiPen:

- Chapter 30 (Title 38, U.S. Code) - Montgomery GI Bill for Active Duty and Veterans
- Chapter 32 (Title 38, U.S. Code) - Veterans Educational Assistance Program
- Chapter 35 (Title 38, U.S. Code) - Dependents of Disabled/Deceased Veterans
- Chapter 1606 (Title 10, U.S. Code) - Montgomery GI Bill for National Guard & Selected Reserves

To be eligible for VA educational benefits, you must be a degree-seeking student with a declared major at DigiPen. Eligibility for the various VA educational benefits programs is determined, in part, by your date of enlistment. In all cases, the Department of Veterans Affairs makes the final determination of eligibility. Application forms for your VA benefits are available at *www.va.gov.*

If you are a prospective student and believe you might be eligible for educational benefits, contact DigiPen's Financial Aid Office for more information and to begin the application process. The Financial Aid Office may assist veterans in seeking other sources of financial aid in addition to their VA educational benefits.

#### Enrollment Requirements

Full-time enrollment for traditional undergraduate students consists of 12 credits per semester; for graduate students, it is 9 credits per semester. At a minimum, an undergraduate student must be enrolled at least half-time (6-11 credits) in order to be eligible for federal financial aid; half-time graduate student enrollment is 6-8 credits. Changes in a student's enrollment may require an adjustment and/or repayment of financial aid funds awarded.

**Financial Aid Eligibility**

To be considered for financial aid, you must satisfy the following:

- Be a U.S. citizen, national, or permanent resident.
- Have a valid Social Security number.
- Have a high school diploma or GED.
- Make Satisfactory Academic Progress.
- Be enrolled as a regular student in a matriculated program.
- Be at least a half-time (6 or more credits) student.
- Not actively in default of any federal loan program.
- Progress in program does not exceed the allowable limits (150% of your program).
- Males between the ages of 18-26 must be registered with the Selective Service System.

*Proof of Citizenship*

The U.S. Department of Education will attempt to match your immigration status verification with the Department of Homeland Security (DHS). If there is a match, your Student Aid Report (SAR) will reveal that your claim of an eligible immigration status has been confirmed. If there is no match, the Financial Aid Office will need to further obtain confirmation of your immigration status. A decision determination about your Financial Aid eligibility will not be made until you have submitted your immigration documents and they have been confirmed. For additional information, please contact DigiPen's Financial Aid Office.

*Deadlines*

In order to obtain federal financial aid, the Financial Aid Office must have confirmation that you have completed and finalized your Free Application for Federal Student Aid (FAFSA) and that your FAFSA has been approved by the last day of enrollment. You will not be able to receive any disbursement of federal funding until the Financial Aid Office has determined that your application information, including confirmation of your immigration status, is complete and correct. If you do not meet the above deadlines, you will lose your eligibility to receive federal funding for the current award period.

**Satisfactory Academic Progress for Financial Aid**

*Probation*

Students will be placed on Financial Aid Probation for the following semester if they are not meeting Satisfactory Academic Progress (SAP). Students on Financial Aid Probation remain eligible to receive aid, but they will be notified in writing and by DigiPen email that improved academic performance is expected. For further clarification, please see the SAP section in this catalog.

*Suspension*

If students do not meet SAP after one semester of probation, they will be placed on Financial Aid Suspension at DigiPen and will have their financial aid cancelled until they have attained SAP.

*Special Terms for Graduate Students*

Graduate students are required to maintain a cumulative GPA of 3.0 or better. If a graduate student's cumulative GPA falls below 3.0, then he or she will be placed on academic probation. Probationary students must earn 3.0 GPA or higher in their graduate-level classes in subsequent semesters until the cumulative GPA is 3.0 or better. Students who fail to attain a minimum of a 3.0 in graduate-level classes during a probationary semester will be academically terminated. These students may apply for re-admission after a 12-month suspension.

Students who fail to complete their program within 55 attempted credits will be placed on academic probation. Probationary students will work with their graduate advisor to develop a completion plan that outlines the quickest path to completion. Failure to meet the terms of this plan will result in academic termination.

*Appeals for Undergraduate and Graduate Students*
A student on Financial Aid Suspension may appeal by indicating in writing to the Financial Aid Office (a) reasons why he or she did not achieve academic standards and (b) reasons why his or her aid eligibility should not be terminated or should be reinstated. Please include appropriate documentation (letters from physicians or instructors, etc.) to support the statements in your appeal. Each appeal will be considered on a case-by-case basis. Individual cases will not be considered as precedent. Financial aid cannot be reinstated for a prior semester. Your appeal should be submitted within 21 days of the beginning of the semester you want aid reinstated. The Financial Aid Director will review the appeal and, if necessary, have DigiPen's Financial Aid Appeals Committee review the appeal within two weeks of its receipt to determine whether the financial aid disqualification or suspension is justified. Students filing an appeal will be advised in writing of the decision. The committee's decision is final, and it cannot be appealed to a higher level. If your appeal is approved, reinstatement of aid is dependent on availability of funds.

*Reinstatement*
Students on Financial Aid Suspension can re-establish their financial aid eligibility after successfully completing - without receiving financial aid - at least 12 credit hours with the required GPA. Students can complete these hours at DigiPen or another accredited institution.

**Washington State Need Grant Satisfactory Academic Progress Policy**
To be eligible for financial aid, federal regulations require students to make satisfactory progress in an eligible degree or certificate program. Students must be in good academic standing with DigiPen Institute of Technology, and the policy applies to all semesters of enrollment, regardless of receiving financial aid. All credits attempted at DigiPen will be considered when determining students' academic progress.

If students do not meet the requirements, they will be placed on financial aid probation or suspended from financial aid. If placed on probation, students must make satisfactory progress in their next semester of enrollment or their financial aid eligibility will be terminated. Eligibility can be reinstated using one of the options in this policy.

Please note that the Washington State Need Grant Satisfactory Academic Progress Policy operates differently than that of the Financial Aid Satisfactory Academic Progress Policy. For detailed information, please contact the Financial Aid Office or visit *www.digipen.edu*.

**Withdrawal from the Institute**
If at any time, a student decides to leave DigiPen Institute of Technology, it is absolutely necessary for him or her to see the Financial Aid Office or to make an appointment with the Financial Aid Office for an exit interview prior to leaving the Institute. This applies to students who are withdrawing and/or transferring to another institution. Failure to meet for an exit interview may increase the risk of defaulting on student loans, as well as incurring a potential liability to DigiPen for not maintaining compliance with a federal requirement. Students who withdraw may be subject to the return of Title IV Funds.

#### Return of Federal and State Funds and Repayment Policy

DigiPen's institutional refund policy operates independently from the return of Title IV and state funds' policy required for all financial aid recipients. The return of Title IV and state funds policy applies to students who cease enrollment prior to the end of a financial aid "payment period." The return of federal financial aid funds policy is applied to all financial aid recipients who withdraw, drop out, or otherwise fail to complete 60% of the payment period for which they have received federal funds. Unearned Title IV funds (grants and loans) must be returned to the appropriate federal program by both the Institute and the student.

The percent of funds "earned" is based upon the number of days completed in the payment period divided by the number of hours in the payment period for which the student received federal funds. The percentage of assistance "earned" is equal to the percentage of the payment period completed. The percentage of federal funds "unearned" equals 100% minus the percent of federal and/or state aid "earned." The student and the Institute may retain the earned portion of aid, but both are required to return a portion of the unearned aid to the appropriate federal grant and/or loan program. Amounts returned to grant programs if applicable, are reduced by 50%.

If you have any questions regarding the refund policy of federal or state funds, please contact the Financial Aid Office.

# Applying to DigiPen

#### Visiting DigiPen

DigiPen offers regular information sessions both on-campus and online for the general public. Anyone interested in finding out more about DigiPen Institute of Technology and its programs is welcome to attend. For information on dates and times for these information sessions, please visit our website at *www.digipen.edu* or email *admissions@digipen.edu*.

Visitors interested in learning about DigiPen's admission requirements, application process, and degree programs are encouraged to schedule a one-on-one meeting and school tour with an admissions representative. To schedule an appointment, please contact the Office of Admissions at *admissions@digipen.edu* at least one week before your intended visit.

One of the best ways to find out what DigiPen is like as a student is to spend a day on campus, attending classes and meeting students, faculty, and staff. Throughout the fall and spring semesters, the admissions department can help prospective students arrange to shadow a current student. Most visitors will combine a student shadow with a one-on-one admissions or financial aid meeting. Student shadow requests should be made at least one week in advance. To learn more about this program and to schedule a time for your visit, please contact the Office of Admissions.

**Undergraduate Application Process**

DigiPen Institute of Technology works on a rolling admissions basis and only enrolls new students for the fall semester that begins each September. DigiPen begins accepting applications for the following fall as early as late September, and the Institute will evaluate applications as they are completed and submitted. Applicants normally receive a decision within two to four weeks after their application has been completed. DigiPen encourages new applicants to apply by February 1 of each year, but the Institute will continue to accept qualified applicants after that date until all programs have reached their maximum enrollment. Applicants should submit all application materials within four weeks of their initial application submission. Applicants who need additional time should request an extension, after submitting their initial application, by contacting the Office of Admissions at *admissions@digipen.edu*. Except where noted, all undergraduate applicants must submit the following for consideration:

1. DigiPen Institute of Technology Application for Admission. All applications will be given equal consideration; however, submitting applications online is the preferred method.

2. $35.00 application fee. If an applicant is denied admission to the program, DigiPen will refund the application fee.

3. Official high school transcripts or official GED test scores, if applicable. International students should submit attested copies or certified true copies of all academic records. See more about this requirement in the "International (Non-U.S. Resident) Applicants" section if an applicant has transcripts and other official documentation in languages other than English.

    - DigiPen requires all applicants to have completed grade 12 or the equivalent with a minimum 2.5 cumulative GPA; for international students, DigiPen will determine the minimum academic performance standards based on the educational system of the individual applicant.

    - Applicants who have earned their GED should submit sealed transcripts for the time that they attended high school, along with their GED test scores to prove high school equivalence.

    - Home-schooled applicants who have completed an accredited curriculum may submit official transcripts. Home-schooled applicants who have not completed an accredited curriculum should submit official GED test scores as proof of having earned their high-school equivalence.

4. Official transcripts from ALL post-secondary institutes attended, if applicable. International students should submit attested copies or certified true copies of all academic records. Again, see more about this requirement in the "International (Non-U.S. Resident) Applicants" section if an applicant has transcripts and other official documentation in languages other than English. This includes transcripts for high school concurrent enrollment programs. Transcripts must be sent by the issuing school directly to DigiPen Institute of Technology. Alternatively, they may be sent by the applicant if they are SEALED in an envelope and stamped over the seal by the Registrar, showing that they have not been opened.

5. 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. The writing portion is not required but may be taken into consideration if sent. Applicants to DigiPen's undergraduate degree programs do not need to submit these if they have already graduated from high school and have at least one year of college experience. However, 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 high school transcripts. SAT code: 4138; ACT code: 6659.

6. Personal statement. Please see the Personal Statement section below for the requirements and recommendations about completing this important component of the application.

7. Letters of recommendation (optional). Two letters of recommendation from individuals familiar with your academic background and/or work ethic, i.e. an instructor, guidance counselor, or employer. Recommendation letters from family members will not be considered. Each letter MUST be sealed, signed, and dated by the author, and each must contain a contact phone number. Please download the recommendation letter templates online at *https://management.digipen.edu/srs-app/* or contact the Office of Admissions at (425) 558-0299 for copies to be mailed to you. Please note that these letters are NOT REQUIRED for applicants to DigiPen's undergraduate degree programs.

8. Other official documentation, if applicable. This includes, but is not limited to, TOEFL scores, copy of Permanent Resident card, and a financial responsibility form for international students.

9. Art portfolio. This is only required of applicants to the Production Animation (B.F.A.) and Game Design (B.A.) degree programs. Please see the Portfolio section below for complete details about this important component of the application.

10. Game Modification Analysis. This is only required of applicants to the Game Design (B.A. or B.S.) programs. Please see the Game Modification Analysis section below for more details.

11. Character or world analysis. This is only required of applicants to the B.S.G.D. program. Those applying to the B.A.G.D. program may submit this as an optional application component. Please see the Character or World Analysis section below for more details.

12. Optional application components for Game Design applicants:

    - B.A.G.D. applicants: character/world analysis, sketches of level designs.
    - B.S.G.D. applicants: sketches of level designs, photos of landscapes and urban environments that inspire you, drawings or sketches made by the applicant.

    Please do not submit electronic games or mods you have created -- the Office of Admissions will not be installing any of these.

#### Personal Statement

Your personal statement is an important part of your application for admission to DigiPen Institute of Technology. What you write will help us find out information about you that is not apparent from your application or transcripts.

*Topics*

Please address the following four topics in your personal statement:

1. Discuss your reasons for applying to DigiPen and explain how these reasons relate to your future goals (personal, education, and professional).

2. Teachers can inspire us to do great things. Tell us about a great teacher and what you learned through his or her example or inspiration. You may discuss a schoolteacher, coach, mentor, or someone who taught you something without even realizing it.

3. Critique a piece of work. In less than 500 words, fully describe a game or a piece of artwork (painting, drawing, sculpture, film, etc.) that you disliked. Explain in detail why you disliked it and what you

would have done to improve it. Focus on a few key areas, and be specific about your improvements.

4. Optional essay. Use this optional essay to explain any unusual circumstances or situations that you think may have an impact on your application.

*Guidelines for the Personal Statement*
Please consider the following:

- Spelling, grammar, and content will be considered, so proofread your personal statement carefully.
- Except where noted, each question should be answered in no less than 150 words and in no more than 300 words.
- Applicants may answer each question individually or all together in full essay form.

*Submission*
Applicants may choose to type the answers to the personal statement directly into the online application (in which case, there is an electronic signature and date stamp) or to mail a hardcopy to DigiPen's Office of Admissions where it will be added to the applicant's file. Those who opt for online submission of the personal statement should be sure to have their answers drafted and prepared before beginning the online application.

*Formatting for Hardcopy Submission*
Please adhere to the following requirements if submitting the personal statement in hardcopy format:

- Applicant's name and program to which s/he is applying should be printed at the top of each page.
- Each page should be typed and double-spaced.
- The completed personal statement should be signed and dated on the last page.

**Math & Science Requirements & Recommendations for Bachelor of Science Applicants**
In addition to the requirements listed for all undergraduate applicants, those applying to any of the Bachelor of Science programs (R.T.I.S., C.E., or G.D.) must have completed grade 12 or the equivalent with a recommended "B" average (3.0 GPA) in mathematics. At a minimum, applicants to any of DigiPen's Bachelor of Science programs should have completed coursework in Algebra and Geometry. Moreover, applicants need to have completed Pre-Calculus -- or be in the midst of completing it -- before we can evaluate their application. Please note that if an applicant is currently enrolled in Pre-Calculus, he or she must submit the first quarter/semester grade for this course. Admissions will try to evaluate his or her application based on the current grade in Pre-Calculus. Additionally, applicants to the Bachelor of Science programs are encouraged to take Calculus, Physics, Computer Science, and related AP courses before coming to DigiPen.

**Portfolio**
DigiPen's intent in reviewing applicants' portfolios is to ensure that students have appropriate foundational skills relative to the degree programs to which they are applying.

*Portfolio Requirements for B.F.A. & B.A.G.D. Applicants*
Applicants to the Production Animation (B.F.A.) and Game Design (B.A.) degree programs must submit an art portfolio. This portfolio should contain between 15-20 samples of original artwork by the applicant for review. At least ten pieces of the portfolio must be drawings from direct observation; they may not be from photos or other 2D reference or from the student's imagination. The rest of the pieces beyond the first ten drawings should demonstrate an applicant's artistic range and skill. Samples of animation, figure/animal studies, character designs, architectural renderings, landscape studies, sculpture, and painting are preferred for this part of the portfolio. B.A.G.D. applicants may include sketches of level designs for games. If necessary, DigiPen may request more samples for review.

The portfolio should demonstrate the following:

1. The applicant has adequate foundational drawing skills to handle the rigors of the curriculum. The portfolio should include at least ten drawings directly from live observations, preferably of people and animals (not from an applicant's imagination or from two-dimensional references such as a photograph or another artist's work). The drawings should clearly communicate the structure and three-dimensional form of the subject. The emphasis should be on representational accuracy rather than on cartooning or heavy stylization.

2. The applicant is a serious amateur artist. The portfolio should include five to ten samples of the applicant's best work regardless of subject matter or medium. This work should be selected with an eye toward quality, design, composition, and a dedication to craft.

*Guidelines for All Portfolio Submissions*
Please keep the following in mind when submitting your portfolio:

- Applicants should label portfolios clearly with their name on the front.
- All artwork should be labeled with the date of completion and medium used.
- Color copies, photocopies, slides, photographs, or work contained on CDs will be accepted, since portfolios will NOT be returned.
- Applicants who submit hard copies of artwork should contain their portfolios in 8.5x11-inch binders.

#### Game Modification Analysis for Applicants to Game Design Programs

Applicants to either the B.A.G.D. or B.S.G.D. programs are required to submit a Game Modification Analysis with their application. For this application component, please write a two- to three-page essay about changing the rules for one of the following:

- Sports: basketball, baseball, hockey, or football (soccer or American football).
- Board Games: Chess, Go, *Monopoly*, or *Settlers of Catan*.

In your essay, you must explain the overall goal of your changes. For example, your goal could be (but is not limited to) making the game more compelling, more challenging, easier for new players to understand, or appeal to a broader audience. Be sure to explain in detail each change you made, why you made the change, and how that supports the overall goal. The detailed explanation of why you made each change and how it supports the overall goal is the most important aspect of the essay, not whether your design changes are "correct."

You will need to make at least three distinct changes to the rules in order to have enough detail for an effective essay. This means that you may not want to pick a sport or game that you are passionate about and do not want to change much -- it is better to pick one to which you want to make significant and interesting changes.

#### Character or World Analysis for Game Design Applicants

Applicants to the B.S.G.D. program are required to submit either a Character Analysis or World Analysis essay with their application. **B.A.G.D. applicants are invited to submit this as an optional component to their application packets.** For this application component, please go to *www.digipen.edu/prospective-students/* where you will find several images of different characters and world locations. You are to select one of these character or world images to analyze.

After you have viewed the picture, please write a two-page essay about this image. If you select a character image to analyze, you must create a background story for the character. For example, you might explain how this character became a warrior or a scientist or whatever profession you see it doing. What led the character to select this profession? How do others react to the character? Additionally, you will need to provide a complete and concise overview of the character, including the following items:

- Name, home (or culture), and class/status.
- Characteristics, skills, talents, or powers.
- Type of game (strategy, first-person shooter, arcade, etc.) you see them in.
- Character motivation: what pushes them on a challenge or adventure?
- Fighting style, if any.
- Other relevant attributes.

If you select a world location to analyze, you must explain the following:

- Type of game that could take place there: think outside the box.
- Type of world it is: futuristic, present day, fantasy, Western, science fiction, etc.
- Culture or civilization existing in this world.
- World obstacles that hinder a player: for example, oceans limiting player movement, etc.
- Ecology of the world as it relates to gameplay.
- Other relevant characteristics.

B.S.G.D. applicants are being asked to do this so that we may evaluate their ability to think creatively and to communicate their ideas. Please keep in mind that this should be written as an essay rather than simply a list of details. Whether you choose a character or world image to analyze, be sure to explain how details in the image led you to make your conclusions about the character or world. For either the Character Analysis or World Analysis, you may expand on the items listed above; at a minimum, however, you must address those listed. Additional instructions about the Character and World Analysis essays may be posted along with the images to select from and analyze.

#### Graduate Application Process

All Master of Science in Computer Science applicants should complete their application by July 1 to guarantee timely evaluation of their application. Any applications completed after July 1 may not be evaluated for the current application year. All graduate applicants must submit the following:

1. DigiPen Institute of Technology Application for Admission. The preferred submission method is online, but all applications will be given equal consideration.
2. $35.00 application fee. If an applicant is denied admission to the program, DigiPen will refund the application fee.
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 DigiPen's Master of Science in Computer Science should note that an acceptable score for the combined GRE verbal and math portions should be at least 1000 or higher. In special cases of highly qualified applicants, we will consider those who do not meet this minimum acceptable score but who have other overriding strengths in the areas of specialization relevant to this program.

All applicants with an undergraduate degree in any major other than Computer Science or Computer Engineering are required to submit scores for the GRE Subject Test in Computer Science as well.

4. Official transcripts from ALL colleges and universities attended. International students should submit attested copies or certified true copies of all academic records. See more about this requirement in the "International (Non-U.S. Resident) Applicants" section if an applicant has transcripts and other official documentation in languages other than English.

    - Applicants must provide evidence of their completion of a bachelor's degree with a recommended minimum 2.5 cumulative GPA; for international students, DigiPen will determine the minimum academic performance standards based on the educational system of the individual applicant.

    - Official transcripts from all colleges and universities attended must be sent directly by the issuing institutions. Alternatively, applicants may send their transcripts if they are SEALED in envelopes and STAMPED across the seal by the Registrar.

5. Two letters of recommendation. These MUST be from individuals familiar with your academic background and/or work ethic, i.e. an instructor, guidance counselor, or employer. Recommendation letters from family members will not be considered. Each letter MUST be sealed, signed, and dated by the author, and each must contain a contact phone number. Please download the recommendation letter templates online at *https://management.digipen.edu/srs-app/* or contact the Office of Admissions at (425) 558-0299 to have copies mailed to you.

6. Statement of Purpose. Guidelines for the Statement of Purpose will be included on the Application for Admission.

7. Other official documentation, if applicable. This includes, but is not limited to, TOEFL scores, copy of Permanent Resident card, etc.

#### International (Non-U.S. Resident) Applicants

DigiPen Institute of Technology welcomes students from all countries and cultures. Because of language and educational differences, DigiPen does require some additional information from international applicants in order to ensure a successful experience for students. International applicants are also asked to complete the application process early to allow time to process required documents for the U.S. Immigration and Customs Enforcement (ICE).

In addition to attested copies or certified true copies of all academic records and any other degree-specific requirements found under the undergraduate or graduate admission requirements, all international applicants must meet the following minimum requirements:

1. Proficiency in the English Language (as demonstrated by one of the following)

    - A minimum Test of English as a Foreign Language (TOEFL) score of 550 (paper exam), 213 (computer exam), or 80 (IBT - Internet-Based Test). TOEFL code: 4138.

    - Completion of four years of high school in the United States at an English-speaking school, or an International School where the primary language of instruction is English.

    - Completion of a bachelor's degree at an English-speaking institution.

    - Other proof of English proficiency, such as through the submission of IELTS scores, may be accepted on a case-by-case basis.

2. Financial Responsibility

    - Evidence indicating that sufficient funds are available for the eight-month period of study and living expenses must be submitted to DigiPen and made available to the U.S. ICE upon entry into the United States. The Financial Responsibility Form must be submitted, regardless of whether or not a student is living in the U.S.

International students intending to study at DigiPen must obtain an F-1 visa from the U.S. ICE. An F-1 student is a non-immigrant who is pursuing a full course of study towards a specific educational or professional objective at a school in the United States. Once that objective has been attained, the F-1 student is expected to return to his or her residence abroad. International students should note their citizenship on the application form for admission. If accepted, DigiPen will send you a Form I-20 (Certificate of Eligibility for Nonimmigrant [F-1] Student Status). If you are a foreign citizen and are accepted, but do not receive a Form I-20 in your acceptance packet, please contact the Office of Admissions.

After you receive your I-20 form, take it to the nearest U.S. consulate to obtain a student visa. Please note that the visa process may take several months to complete, so DigiPen recommends that you complete your application process early. You must also take your Financial Responsibility Form and documents to prove that you have sufficient financial resources for your education and stay in the United States. For more information on visas, please consult the U.S. Immigration and Customs Enforcement web page at *www.ice.gov.*

Applicants who are Permanent Residents of the United States do not need a student visa; however, they must prove their immigration status by submitting a copy of their permanent residency card and marking the appropriate citizenship status on the application for admission. The copy of the permanent residency card confirms that a student is a legal resident and that he or she may pursue studies at DigiPen. Permanent residents are subject to the same rights, services, and rates as U.S. citizens.

*International Students with Transcripts in Languages Other than English*

You must submit all credentials in both the original language and English. The English translation must be literal, or word-for-word. For information on qualified translators in your area, please contact the American Translators Association (*www.atanet.org*) or another recognized translation service. Please note that self-translated copies are not acceptable. All transcripts and diplomas must be issued by the degree-granting university. If your university issues official documents in English, an additional English translation is not required.

#### Admission/Denial to DigiPen's Programs

DigiPen considers every part of an applicant's materials and qualifications when evaluating him or her for admission. Meeting the minimum standards is not a guarantee for admission. Applicants who exceed the minimum standards are more likely to be admitted.

Accepted undergraduate and graduate applicants will receive an enrollment packet via standard mail. This packet will include a student enrollment agreement, information on financial aid, student affairs information, and, if applicable, a request to furnish proof of high school graduation or completion of a bachelor's degree before the start of classes in the fall. By returning the signed enrollment agreement, proof of graduation, and the enrollment fee, an applicant has confirmed enrollment. Applicants who are accepted and enroll are required to attend an official orientation session prior to the start of the program.

Applicants who are not accepted to the Institute will receive a letter of denial by mail. If an applicant is denied admission to a degree program, the application fee will be refunded. When possible, DigiPen will attempt to provide information about the specific areas in which an applicant needs improvement if he or she wishes to reapply in subsequent years. Please see the section on re-applying for more information.

**Reapplication Process**

Applicants who are denied admission are encouraged to re-apply for a future year. By improving the areas suggested on the original decision letters (i.e. improving grades by taking community college courses, devoting more time and energy to a new art portfolio, etc.), many of those individuals re-applying for admission are accepted. To re-apply, applicants should submit a new application form and indicate that they have applied previously for admission. The Office of Admissions retains all materials submitted by applicants for a period of five years. Therefore, items such as transcripts, letters of recommendations (optional for applicants to DigiPen's undergraduate degree programs), and test scores can be transferred from an applicant's original file to the new application file. Students who are re-applying need to supply the following materials only:

- New application form. Please submit online.
- $35.00 application fee.
- Any new or updated documents, such as new transcripts, new test scores, etc.
- One additional letter of recommendation if those already on file are more than twelve months old. Please note that letters of recommendation are REQUIRED for applicants to DigiPen's graduate program but are NOT REQUIRED for applicants to the undergraduate degree programs.
- A short essay describing the progress and improvements that the applicant has made in the areas recommended in the original decision letter.
- After submitting their new application, readmission applicants are encouraged to contact the Office of Admissions by email at *admissions@digipen.edu* to confirm whether any additional materials are needed for the completion of their application.

**Readmission Information**

Any student who wishes to return to DigiPen after an absence may apply to do so by completing a Readmission Application and submitting a non-refundable application fee, official transcripts from all institutions attended since last attending DigiPen, and other official documentation for specific circumstances as requested below:

*Medical Withdrawals*

A physician's statement must be included, and it must indicate that you are ready to resume your studies. Additionally, it should describe any special needs you may require upon your return to the Institute.

*Readmission after Academic Dismissal*

A statement explaining what you have been doing since you last attended the Institute, why you would like to return, and how you plan to be successful by returning should be submitted as part of your application for readmission.

*Readmission after Disciplinary Action*

Please include a formal appeal for the Disciplinary Committee to review along with your application for readmission. You must receive clearance from the Disciplinary Committee to return.

*Readmission for Personal Reasons*

There are usually no impediments to returning to the Institute if there is space available; however, an academic plan may need to be developed with your advisor upon

re-enrollment, and students requesting readmission after an extended period of time must meet with an academic advisor to determine the viability of completing their degree program.

*Readmission after Non-Payment of Account*
You must settle your account before applying for readmission. Once you have settled your account, then the readmission policy follows the same guidelines as being readmitted for personal reasons.

*Readmission after Military Service*
In compliance with the Higher Education Authorization Act, any student whose absence from the Institute is required by reason of service in the uniformed services shall be entitled to readmission to the Institute if the student (or an appropriate officer of the Armed Forces or official of the Department of Defense) gives advance written or verbal notice of such service to the Registrar's Office. This is provided that the cumulative length of the absence and of all previous absences from the Institute, by reason of service in the uniformed services, does not exceed five years, and, except as otherwise provided in this section, the student submits a notification of intent to re-enroll in the Institute.

*Exceptions to these requirements will only be made on a case-by-case basis at the discretion of the DigiPen Administration.*

**Submission of Official Transcripts**
All readmission applicants to DigiPen must request an official transcript from the DigiPen Registrar's Office to be sent to the Office of Admissions as part of their application. If you have taken courses from another college since leaving DigiPen, you must have also have an official transcript forwarded to the Office of Admissions from the registrar of each institution attended. The transcripts should show all academic work through the last semester you completed. If you are approved for readmission with coursework in progress, your admission status will be provisional pending receipt of your final transcript.

**Non-Matriculated Studies**
Applicants who are interested in taking individual courses that are part of DigiPen's degree programs may register for them based on each semester's course offerings and availability. Applicants will be handled on a first-come, first-served basis.

Please note the following:

1. Applicants to the Non-Matriculated Studies program must show proof of graduation from high school and a minimum 2.5 GPA in their most recent studies for acceptance into the program.

2. Upon application, a degree program track must be selected.

   - To follow a Bachelor of Science track, applicants must show a "B" average in math and having completed coursework through a minimum of Pre-Calculus.
   - To follow a Bachelor of Arts or Bachelor of Fine Arts track, applicants must submit an art portfolio.

3. Students must pass or show proof of having passed prerequisite courses before they are able to register for more advanced courses. Waiver exams may be administered if the student feels he or she has achieved proficiency.

4. Students must earn a "C-" or better to pass courses that are core to their chosen track.

5. Students must maintain a minimum 2.0 GPA in order to remain enrolled in the Non-Matriculated Studies program. Enrollment is on a continuous basis unless students do not register for classes for a given semester.

*Please note that courses taken in the Non-Matriculated Studies program do not lead to a degree and are not applicable to earning a professional certificate from DigiPen.*

# Waiver Credit, AP Examinations, CLEP, and Other Credit

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 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. For undergraduate programs, no less than 75% of a student's total program must be taken at DigiPen. Graduate programs allow a maximum of six transfer credits from other colleges and other DigiPen programs. Course transfers and waivers are processed at $25.00 per credit.

**Course Waiver Examinations**

Students may meet an academic requirement, within specified limits, by passing a waiver examination at least equal in scope and difficulty to a final examination in a course. Successful completion of the examination waives the curricular requirement for a specific course but does not result in credit earned. Waiver credits will not reduce the total number of semester hours required for a degree; however, they will increase the available number of elective hours for a degree. Waiver examinations must be taken prior to the final semester of residence at DigiPen, and they may not be repeated.

Students have the opportunity to waive designated core courses by demonstrating mastery of the material in two steps:

1. A waiver petition to the respective department, indicating prior academic coursework and relevant work experience in the subject area; and

2. Performance on a *placement exam* offered by the respective department at the beginning of each term.

To petition waiving a core course, the student must complete a waiver request for each course, submit a transcript or photocopy of transcript with relevant coursework highlighted, and submit the requests to the Office of the Registrar. Waiver requests may be completed online through the SRS system. Once submitted, approval of waiver requests are decided by the department appropriate to the courses. For waiver requests received by July 1, students will receive notification by August 1. Waiver requests arriving in the Office of the Registrar after July 1 will be handled on a rolling basis, as faculty schedules allow. Results of waiver requests received after the deadline are not guaranteed to be available before the start of classes.

It is not possible to predict the results of faculty review of core course waiver requests. Core courses generally include intermediate-level material, so a student who has completed only introductory work in a subject is not likely to be granted a waiver. Faculty take many factors into consideration, including the academic caliber of the school where the course was taken, the difficulty of the text, the grade received, and the time elapsed since completion of the course.

The following restrictions apply to all waiver examinations:

1. A student must have an approved waiver request on file before credit by examination can be recorded on the permanent record.

2. A student must be currently enrolled before a waiver examination can be recorded on the permanent record.

3. A maximum of 15 semester hours may be waived toward a bachelor degree.

4. Examinations may not be repeated.

5. Repeat course work and "F" grades are not open to waiver requests.

6. Students may not take waiver examinations on courses they have audited.

**Advanced Placement Examinations**

Course waivers or credit may be granted for satisfactory achievement on Advanced Placement Exams of the College Entrance Examination Board taken within the last ten years. An exam score of four or above earns from three to six course waiver credit hours. No grades will be assigned to the courses, nor will they be figured into a student's grade point average. Courses waived or transferred are entered on students' transcripts, but no grades or quality points are awarded. Official results must be sent to the Registrar before course waivers or transfers are granted.

A maximum of two courses may be waived or transferred through AP examinations, and these may be applied to satisfy DigiPen's degree requirements. The examinations and the courses for which waiver hours or credit are granted are listed below. Waivers/credit granted for a specific course count toward the satisfaction of any requirement toward which the listed course counts.

| AP Exam | Minimum Score | DigiPen Course |
|---|---|---|
| Art - History of Art | 4 | ART 210 |
| English - Literature and Composition | 4 | ENG 110 |
| English - Language and Composition | 4 | ENG 110 |
| History - World History | 4 | HIS 100 |
| Japanese | 4 | JPN 101 |
| Mathematics - Calculus AB | 4 | MAT 150 |
| Mathematics - Calculus BC | 4 | MAT 150 |
| Physics B - Physics (Introduction) | 4 | PHY 115 |
| Physics C - Physics (Mechanical) | 4 | PHY 200 |
| Psychology | 4 | PSY 101 |

**International Baccalaureate (IB)**

In general, three semester credit hours are waived for each Higher Level subject in which a score of five or greater was earned in the last ten years.

The IB courses and scores listed below are eligible for waiver hours at DigiPen.

| Course & Level | Score |
|---|---|
| Computer Science - HL | 5, 6, 7 |
| English (A1 & A2) - HL | 5, 6, 7 |
| Mathematics - HL | 5, 6, 7 |

**College-Level Examination Program (CLEP)**

There are two types of CLEP examinations: General and Subject. DigiPen grants credit or course waivers for Subject Examinations only, and credit will be given only in those areas in which comparable courses are offered at the Institute. Courses waived or transferred are entered on students' transcripts, but no grades or quality points are awarded. These exams may not be repeated. Examination must be taken prior to the student's completion of a total of 40 hours of college credit, and official results must be sent to the Office of the Registrar.

CLEP offers a number of subject-matter examinations. Students obtaining the percentiles established by the mathematics, computer science, and humanities and social sciences departments will receive credit toward those basic requirements. Students wishing credit in courses other than those listed above should consult the appropriate departmental chair. DigiPen will grant credit to students who pass the CLEP Subject Examinations approved by the department appropriate to the examination. The score necessary to receive credit through a Subject Examination will be the mean score achieved by C students in the national norms sample. The appropriate department will determine the number of course credits to be given for passing a Subject Examination.

Students should check with the College Board at *www.collegeboard.org* for further details and information concerning test centers and dates.

#### Transfer Credit

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. 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.

#### Articulation Agreements

Credits from a college with an articulation agreement with DigiPen Institute of Technology will be accepted, and grades earned will be included in students' DigiPen transcripts. Please contact the Registrar for a list of colleges with articulation agreements.

#### Credit Evaluation Forms

Application forms for challenge and waiver examinations may be obtained from the Registrar or online. A student must have approval for an exam prior to taking it.

#### Transferability of Credits to Other Institutions

A student wishing to transfer DigiPen credits to another institution may request the Institute to furnish transcripts and other documents necessary to a receiving institution. The Institute advises all prospective students that the courses and credits reflected on their transcript may or may not be accepted by a receiving institution. Students should inquire with the specific receiving institution about the transferability of DigiPen credits.

#### Granting Credits for Work Experience

DigiPen does not grant credit for work experience.

# Standards of Progress

**Semester Credit Hour**

The semester credit hour is the basic unit of credit awarded at the Institute. The academic value of each course is stated in semester hour credits. As a rule, one semester credit hour of academic credit is given for at least 15 hours of classroom contact, at least 30 hours of supervised laboratory time, at least 30 hours of documented independent study activities, or at least 45 hours of internship or work-related experience. In addition, undergraduate students typically will be expected to spend two hours in preparation outside of class for each hour of lecture. Additional outside work may be required for laboratory or studio classes. During the summer session, the student earns semester credit hours for class contact hours that are equivalent to those provided in the fall and spring semesters. Whenever "semester hour" is used in this Catalog, it is synonymous with "semester credit hour" (SCH). A classroom contact hour is 53 minutes in length.

**Grading System**

The following system applies to undergraduate students; for information on the grading system for graduate programs, please refer to the Master of Science in Computer Science program section.

The following grading system is in use and, except where otherwise specified, applies to both examinations and term work. The weight of a final examination grade is a matter individually determined by each instructor. See the following Grade Point Average section for additional information.

A Excellent = 4.0 quality points

A- Excellent = 3.7 quality points

B+ Good = 3.3 quality points

B Good = 3.0 quality points

B- Good = 2.7 quality points

C+ Fair = 2.3 quality points

C Fair = 2.0 quality points

C- Fair = 1.7 quality points

D Poor = 1.0 quality points; lowest passing grade; failing grade for major

F Failure = 0 quality points

The following grades do not affect the GPA:

*AU - Audit*
Indicates that the student attended the course without expectation of credit or grade.

*IP - In Progress*
Indicates that the grade was not available from the instructor at the time the transcript was printed.

*I - Incomplete*
This grade is used when circumstances beyond a student's control prohibit the student from taking the final exam or completing course work. It is not a grade given to students who need to retake a course because the student has fallen substantially behind. Students will not be given an "I" grade for unacceptable reasons, including, but not limited to, the need to rewrite a paper, the demands of a time-consuming job, the desire to leave town for a vacation or family gathering, the desire to do well on tests in other courses, etc. Students who want to repeat a course can drop it prior to the end of the eighth week of classes, and they will receive a "W" (see "Withdrawal" below). Otherwise, the instructor will assign the appropriate final grade ("D" or "F," for example).

Arrangements for the "I" grade and its completion must be initiated by the student and agreed to by the instructor. An Assignment of Final Grade for Completion of an Incomplete (I) Form must be completed each time a grade of "I" is assigned. On the form, the instructor will specify to both the student and the department the work remaining to be done, the procedures for its completion, the grade in the course to date, and the weight to be assigned to work remaining to be done when the final grade is computed.

If make-up work requires classroom or laboratory attendance in a subsequent term, the students should not register for the course again; instead, the student must audit the course and pay audit fees. If the make-up work does not require classroom or laboratory attendance, the instructor and student should decide on an appropriate plan and a deadline for completing the course. When the student completes the course, the instructor will submit a change of grade to the Registrar's Office. Should the work not be completed within the agreed upon time frame, the Institute will assign a grade of "F."

These procedures cannot be used to repeat a course for a different grade. An "I" grade will not be assigned to a student who never attended class; instead, instructors may assign a failing grade.

*W - Withdrawal*
Indicates withdrawal from the course before the end of the eighth week of classes or withdrawal from the Institute. The grade of "W" will not be assigned to any student who has taken the final examination in the course. An instructor may not withdraw a student from a course.

*P - Pass*
Given for internship courses.

**Grade Reports**
Reports of the final grade in each course will be made available online to students soon after the close of each semester. However, grade reports may be withheld from students who have delinquent accounts with the Administration Office, Security, or Library.

**Grade Point Average**
The academic standing of each student is determined on the basis of the grade point average (GPA) earned each semester. The GPA is determined by using the quality points assigned to each course grade a student earns. The quality point value for each grade earned during a semester is multiplied by the number of credit hours assigned to that course as listed elsewhere in this catalog. The sum of these points is the total number of quality points earned during the semester. This sum is divided by the number of credit hours attempted (hours from courses with grades of "A" through "F") to obtain the GPA.

The cumulative GPA consists of all courses completed at DigiPen. If multiple attempts were made for the same course, only the grades earned in the two most recently completed attempts are calculated in the cumulative GPA. Course grades of "AU," "I," "W," "S," "U," and "P" are non-punitive grades, so they are not calculated in the overall GPA since they carry no quality points.

The following example will help you calculate your grade point average:

| Course | Credits | Grade | Points |
|---|---|---|---|
| CS 100 | 3 | A | 12.0 (3 x 4.0) |
| CS 100L | 1 | A | 4.0 (1 x 4.0) |
| MAT 100 | 4 | A- | 14.8 (4 x 3.7) |
| CS 105 | 3 | B | 9.0 (3 x 3.0) |
| ENG 110 | 3 | D | 3.0 (3 x 1.0) |
| CS 120 | 3 | B+ | 9.9 (3 x 3.3) |
| CS 120L | 1 | A- | 3.7 (1 x 3.7) |
| **Totals** | **18** | | **56.4** |

Total grade points divided by total credits equals the cumulative grade point average. Therefore, the grade point average for the above example is 56.4 divided by 18 for a 3.13 GPA.

**Satisfactory Progress**

Satisfactory progress toward a degree by a full-time student is defined as a full attempt of 24 credits during an academic year. This should include registration for at least 12 credits per semester and successful completion of at least 12 credits per semester. "Full attempt" is defined as the receipt of a final letter grade ("A" to "F") but not the receipt of a "W" or an "I." Successful completion is defined as the receipt of a passing letter grade ("A" to "C-" in a degree's core courses, and "A" to "D" in non-major courses). Core courses and non-major courses are denoted under each individual degree program's recommended sequence of required classes chart. The Registrar makes decisions on student status.

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 or more than 1.5 times the recommended time required to complete the program. The Registrar will withdraw from the Institute full-time students who do not complete their studies during this time frame.

*Undergraduate Students*

To maintain satisfactory progress, undergraduate students must attain a minimum cumulative grade point average at various milestones in their program of study.

| Milestone | Minimum GPA Requirement |
|---|---|
| Up to 50% of program<br>- 76 attempted credits for B.S. in R.T.I.S. or C.E<br>- 73 attempted credits for B.S. in G.D.<br>- 72 attempted credits for B.F.A. in P.A.<br>- 71 attempted credits for B.A. in G.D.* | 1.8 or better cumulative GPA |
| Over 50% of program<br>- 77-153 attempted credits for B.S. in R.T.I.S. or C.E.<br>- 74-146 attempted credits for B.S. in G.D.<br>- 73-143 attempted credits for B.F.A.<br>- 72-141 attempted credits for B.A. in G.D.* | 2.0 or better cumulative GPA |
| 100% of program<br>- 154 attempted credits for B.S. in R.T.I.S. or C.E.<br>- 147 attempted credits for B.S. in G.D.<br>- 144 attempted credits for B.F.A.<br>- 142 attempted credits for B.A. in G.D.* | 2.0 or better cumulative GPA |

* An attempted credit is defined as any credit that is awarded a final letter grade ("A" to "F"). Credits earning a "W" or "I" are not considered attempted credits.

Appeals involving extenuating circumstances may be addressed to the Chair of the Student Appeals and Discipline Committee for action and resolution.

*Graduate Students*
Graduate students who take the undergraduate-level classes to make-up an admission deficiency must earn a "B" (or better) for such a class to meet the minimum requirement. During the course of graduate study at DigiPen, students are required to maintain a cumulative GPA of 3.0 at the graduate level. If the cumulative GPA falls below the required standard, the student will be placed on academic probation. Probationary students must earn 3.0 GPA or better in their graduate-level classes in subsequent semesters until the cumulative GPA reaches 3.0 or above. Students who fail to attain a 3.0 in graduate-level classes during a probationary semester will be academically terminated. Terminated students may apply for readmission after a 12-month suspension.

Graduate students who fail to complete their program within 55 attempted credits will be placed on academic probation. Probationary students shall work with their graduate advisors to develop a completion plan that outlines the quickest path to completion. Failure to meet the terms of this plan will result in academic termination.

**Passing Classes and Graduation**
*Undergraduate Students*
All undergraduate students must have a cumulative GPA of at least 2.0 to graduate.

*Graduate Students*
During their course of study, graduate students must have an overall 3.0 GPA to graduate.

**Academic Probation**
Students who fail to maintain the required minimum cumulative GPA or who fail to complete their academic program within the maximum attempted credits allowed will be placed on Academic Probation.

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

Students with a cumulative GPA of 0.5 or lower are not eligible for Academic Probation and become academically ineligible to continue. They will not be allowed to re-register for a period of one academic year. Any student in this circumstance may reapply for admission after they have served one year on suspension.

*Failing to Complete Program within the Maximum Time Frame*
Students who fail to complete their degree program within the maximum time frame, as defined under the satisfactory progress policy, will be placed on Academic Probation to direct them towards completion. Working with their academic advisor, these students will develop a program completion plan that outlines the quickest path to completion. These students will be held to the same conditions of probation as outlined above, with the exception that the maximum credit load per semester is waived.

#### Grade Changes and Appeals

Only the faculty member who administered the grade may make grade changes. In cases where the faculty is not available to consider a grade change, the department chair, in consultation with the Dean of Faculty, may make such a change.

Grade appeals must be made within 14 days of final grades being issued. Using the Grade Appeal Form, appeals are made in writing to the course instructor or the department chair if the instructor is unavailable. Students may appeal to the department chair and then the Dean if a satisfactory resolution is not achieved.

#### Repeating Courses

Students may repeat any course in which they did not receive a passing grade (below a "C-" in a core course, below a "D" in a non-core course), as long as they are in good standing with the Institute and eligible to continue their studies. All grades and attempted classes remain on a student's transcript. However, only the grades earned in the two most recent attempts of a course are calculated in a student's GPA. Courses in which a student has earned a passing grade may be repeated as audit courses only.

#### Course Overload

During a given semester, sophomores, juniors, and seniors may be enrolled in a maximum of 21 credits. Freshmen should check their majors for specific semester maximums. Students seeking special permission to take more than the maximum credits in a given semester should use the Override Form and get approval from their academic advisor.

#### Withdrawing from the Institute and the "W" Grade

To formally withdraw from the Institute, a student must submit a completed Withdrawal Notice Form to the Office of the Registrar. Withdrawal Notice Forms may be obtained from Student Affairs or Financial Aid. Students below the legal age must have a parent or guardian submit the withdrawal notice.

A student may withdraw from the Institute before the end of the eighth week of instruction of a semester. Please note:

1. If a student withdraws before the end of the second week of instruction, no course entries will appear on the student's transcript for that semester.

2. If a student withdraws after the end of the second week of instruction and before the end of the eighth week of instruction, the Registrar will assign a final grade of "W" for each course in which the student was enrolled.

3. At the end of the eighth week of instruction of the semester, withdrawn students will receive final grades for each course in which they were enrolled.

#### Hardship Withdrawal

Students may seek a hardship withdrawal when one of three conditions prevents a student from completing all courses: death of a close family member, catastrophic illness in the family, or injury or illness that incapacitates the student. Hardship withdrawals may be sought any time after the last date to withdraw from classes, as listed in the Academic Calendar, but not after all materials for a course have been completed (i.e., after submitting the final exam or final assignment). The Hardship Withdrawal Form, a personal statement, and appropriate documentation (i.e., death certificate, obituary, letter from a state-licensed physician or mental health professional) must be provided to support all requests to Student Affairs. Once all documents are received, Student Affairs will forward the documents to the Hardship Withdrawal Review Committee.

If the committee grants a hardship withdrawal, the student will receive "W" grades in all classes and is ineligible to receive a grade or an incomplete in any class in that semester. The student will be withdrawn from DigiPen, effective his or her last day of attendance. Regular refund and all Financial Aid policies apply. Students seeking readmission must abide by DigiPen's readmission policy.

**Dean's Honor List Requirements**

Prepared at the end of each fall and spring semester, the Dean's Honor List officially recognizes and commends students whose semester grades indicate distinguished academic accomplishment. Both the quality and quantity of work done are considered.

You must meet the following qualifications to be a recipient of this honor:

1. You must be matriculated.
2. You must be registered full-time in credit-bearing courses.
3. Full-time students must complete 12 or more credits in one semester.
4. Only passing grades ("A," "B," "C," and "D") in credit-bearing courses are counted for eligibility.
5. No failing grades: a grade of "F" in any course makes the student ineligible, regardless of other grades.
6. Minimum GPA of 3.5 is required.
7. Any courses that do not count towards the degree are excluded.
8. AP, Internship, and Independent Study credits are excluded.
9. Pass/Fail credits are NOT to be counted when calculating qualifying credits.
10. Incomplete grades will be evaluated after they are made up. The student must have qualified for the Dean's Honor List before and after the Incomplete grade was made up.

The student's cumulative grade-point average is not considered; only the grade-point average for that particular semester is relevant.

**Process for Grievances and Appeals**

*Concerns over Academic Standing*

Students who would like to file an appeal against a decision regarding their academic standing in a particular course should discuss the matter with their instructor. If a satisfactory resolution is unattainable, students may file an appeal with the head of the department for that course. If the resultant solution is still unsatisfactory, then students may file an appeal with the Dean of Faculty. Students may appeal grades and review exams no later than two weeks after transcripts are issued. The Administration reserves the right to destroy any examination papers after the two-week appeal period. However, academic records will be kept indefinitely.

*Appeal for Refund of Tuition*

Students who would like to file an appeal against a decision regarding their tuition refund shall file a written request to the Office of the Registrar. If dissatisfied with the decision of the Registrar, students may file a second appeal with the Chief Operating Officer. If still unsatisfied with the decision, students may appeal to the Executive Director of the Higher Education Coordinating Board of the State of Washington at:

Higher Education Coordinating
Board of the State of Washington
P.O. Box 43430
Olympia, WA 98504-3430

Schools accredited by the Accrediting Commission of Career Schools and Colleges of Technology must have a procedure and operational plan for handling student complaints. If students do not feel that the Institute has adequately addressed a complaint or concern, they may consider contacting the Accrediting Commission. All complaints considered by the Commission must be in written form, with permission from the complainant(s) for the Commission to forward a copy of the complaint to the Institute for a response. The complainant(s) will be kept informed as to the status of the complaint as well as the final resolution by the Commission.

Please direct all inquiries to:

Accrediting Commission of
Career Schools and Colleges of Technology
2101 Wilson Blvd./Suite 302
Arlington, VA 22201
(703) 247-4212

A copy of the Commission's Complaint Form is available at the Institute and may be obtained by contacting Meighan Shoesmith, Sr. Vice President of Administration. If you are unsure of whom to speak to regarding a complaint, please contact Meighan Shoesmith at the following address:

Meighan Shoesmith - Sr. VP, Administration
DigiPen Institute of Technology
5001 - 150th Ave. NE, Suite #210
Redmond, WA 98052
Tel: (425) 558-0299

#### Transcripts

If a student's financial obligation is not fulfilled, the Institute is authorized to do the following until the owed monies are paid: withhold the routine release of the student's academic records or any information based upon the records, and withhold the issue of the student's transcripts. Should you have any questions, please contact the Administration office at (425) 558-0299.

To request an official transcript, students should complete a transcript request form (available online at *www.digipen.edu*, or from the front office) and either mail or fax it to the Administration office. Requests are usually processed within three business days. Unofficial grade reports can be viewed or printed anytime using the Student Record System (SRS) online.

#### Attendance

Students more than 15 minutes late to class will be marked as absent for that entire class. Students may not leave class early without instructor permission. Students absent from all classes without explanation for a period of two consecutive weeks or more are considered to have withdrawn from the Institute as of their last date of attendance. To withdraw from individual classes, a student must complete the appropriate withdrawal form, either in person or online.

#### Exams

All students are required to be in attendance at the times scheduled by the Institute for final exams. Instructors are not required to make arrangements for individuals to take final exams at a different time than the rest of the class. Should a student miss an exam, it is the student's responsibility to notify the instructor within 24 hours of the missed exam. In the event that a student fails to provide such notification to an instructor, or if the Institute does not find the reasons for missing an exam justifiable, the student will be given a failing grade for the exam(s).

Should a student miss a final exam and notify his or her instructor within 24 hours of the missed exam, the Registrar shall review the individual circumstances. Only documented emergencies will be considered acceptable reasons for missing exams. Exam retakes shall be allowed at the sole discretion of the Registrar and Department Chair. Examples of unacceptable reasons for missing an exam include the demands of a time-consuming job, the desire to leave town for a vacation or family gathering, the desire to do well on tests in other courses, etc.

A retaken exam shall be different than the original one taken by the students, and the timing of it shall be at the sole discretion of the individual instructor. In all cases, retakes shall be administered no later than one week after the original, missed exam.

# Student Internships

**Overview of Internships**

Student internships are monitored, on-site work or service experiences for which students earn credit. All registered juniors and seniors are eligible for internships.

Internships can be arranged for any setting related to a student's career goals. The internship usually takes place in a professional workplace under the supervision of an experienced professional, whereby a high degree of responsibility is placed on the student. Internships can be part-time or full-time, paid or unpaid. They can vary in duration and location. For example, interns have worked at companies in Washington, California, Texas, and New York. They must be approved in advance by the Institute.

**Objectives of Internship Programs**

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

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

Since internships have a strong academic component, students are carefully monitored and evaluated for academic credit. As a rule, one semester credit hour of academic credit is awarded for 45 hours of internship/work experience. Typically, a five credit internship taken during the fall, spring, or summer semester means that the student will spend no less than 225 hours in the experience. Students may register for up to two semesters of internship credit (e.g. R.T.I.S. students may not register for more than 10 internship credits).

The element that distinguishes an internship from a short-term job or community service is the intentional "learning agenda" that the intern brings to the experience. In support of a positive experience for the student and the employer, the Internship Coordinator assists in assuring that the work experience meets both student and organizational needs, with priority given to the student's interests and to the assurance that the experience will result in learning outcomes acceptable to his or her degree program. More detailed information about student internships can be found in the Internship Guidelines available in the Administration Office.

# Change of Major and Graduation

**Requesting a Change of Major**

Current students may request a change of major by submitting a "Change of Major" form to the Office of Admissions, along with any additional materials needed for the major to which they would like to transfer. The Change of Major form is available for pick-up from the Front Office at the Main Campus and online.

Students requesting a change of major between the R.T.I.S. and C.E. programs do not need to submit any additional materials; however, students who wish to switch to either of the Game Design degrees must submit the extra materials (Observational Analysis, Game Critique, and Art Portfolio) before the change of major can be evaluated. Please submit colored copies or electronic files as originals will not be returned. A decision will be sent via email or mail to students requesting a change of major. Students who are approved to change majors will need to sign a new student enrollment agreement for the new major before making the change official.

Students who change their majors are encouraged to meet with their academic advisors or with the head of the program to which they are transferring to determine what changes need to be made to their schedules or recommended course sequences.

*Important Information Regarding Change of Major Requests*

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

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

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

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

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

**Graduation Requirements**

Degrees and certificates will be granted at the end of the semester in which students complete the final requirements. For example, if a student receives an "I" grade in a course required for graduation in his or her final semester, he or she will not graduate until the semester in which the "I" is replaced by a letter grade. During that semester, the student must reapply for graduation.

A program of study must be completed within a reasonable period of time for a student to be eligible for graduation. The Institute defines "reasonable time" as the credit hours attempted cannot exceed 1.5 times the credit hours required to complete the program. Full-time students who do not complete their studies during this maximum time frame will be placed on academic probation and will have to complete their program requirements under the conditions of their academic probation. For more information, please see the section on "Academic Probation."

**Applying for Graduation**

The Institute sets minimum requirements for all students seeking undergraduate degrees. DigiPen reserves the right to change graduation requirements at any time. Every degree candidate is expected to comply with changes in requirements as they relate to the uncompleted portion of coursework.

Most students will follow the graduation requirements published in the catalog for the year they enter DigiPen. Students who interrupt their attendance may be held to the requirements of the current catalog when they return. Students are responsible for ensuring that all graduation requirements have been completed.

Approximately four to six weeks after students apply for graduation, a degree audit report will be issued. This report identifies courses students have taken to complete their degree requirements. This report is used to assist students in planning future coursework to ensure that all graduation requirements are met. Students should take the degree audit report with them when checking progress toward graduation with their academic advisor and/or the Office of the Registrar. Students are responsible for notifying the Office of the Registrar of any changes in their proposed programs and for resolving any questions prior to registering for their final term at DigiPen.

All Incomplete grades and conditions affecting graduation must be removed from the student's record by the last regular class period of the term. All credit course work affecting graduation must be completed by the regular class period of the term. A letter of instruction is mailed to degree candidates in March regarding deadlines and procedures for commencement-related activities.

Undergraduate students who feel there is justification for an exception to these graduation requirements may petition the Appeals/Discipline Committee. Information on filing a petition is available at the Registrar's Office.

**Graduation Application Process**

1. The student completes the Graduation Application and submits the $75.00 graduation fee by the deadlines stated below:

| Graduation Date | Graduation Application Due Date |
|---|---|
| April | December 1 |
| July | April 1 |
| December | April 1 |

2. The academic advisor or administrator will review the most recent transcript or degree plan to verify progress and will notify the student whether or not he or she has completed all courses satisfactorily to date, and, if upon satisfactory completion of courses for which the student is currently registered, he or she will be eligible for graduation.

3. Final approval will not be made until after final grades are submitted and posted to the student's record. Degrees will be mailed as soon as possible after that process, which should be from four to six weeks after completion. The student needs to keep the Office of the Registrar informed of address changes so that degrees are mailed to the correct address.

# Student Affairs

Student Affairs provides services to students in order to support their academic, professional, and personal development. The Student Handbook provides information on the services and procedures that a student will need in their life at DigiPen and beyond, including:

Academic Advising
Academic Support Center
Alumni Services
Campus Life
- Dining Services
- Housing
- Lockers
- Parking/Transportation

Career Services
Counseling Services
Disability Support Services
International Student Services
Student Activities & Organization
Student Programs
- First-Year Seminar
- Graduation
- New Student Orientation

The following sections detail some aspects of a few of the services provided by Student Affairs.

#### Student Advising

DigiPen has adopted a faculty-advisor model to provide academic and career-related advising for students. Your advisor can be either a full-time faculty member from your major or a staff member who is familiar with the requirements of your program. It is recommended that students make an appointment to speak with their academic advisor once a semester. This ensures that a student is enrolling in the correct classes and is doing well in them. Additionally, students are to meet with their advisor when preparing to apply to graduate from the Institute. Students should speak to their advisors about issues related to academic and school policies, scheduling and course selection, override forms and alternate schedules, degree audits and graduation, classroom success, career advising, mentoring, and referrals to other resources.

#### Placement Assistance

Advice on career options is available to enrolled students. With the assistance of Student Affairs and faculty members, the Career Services team works to establish relationships with prospective employers on an on-going basis. It offers resume and job-hunting workshops to supplement career education found in the curriculum. The Institute has a career bulletin board, including an electronic bulletin board, and uses an email mailing list to post current job openings in the industry. The Institute also provides placement services in the form of internships that may be available during the summer; the placement program bases its recommendations of students on their academic performance. Additionally, DigiPen hosts an annual career day that attracts employers from around the country to the campus to review student portfolios and conduct interviews. DigiPen also attends industry events, such as the Game Developer's Conference, to promote the Institute's programs and its students. Placement assistance continues beyond graduation as these services are extended to alumni. For further information, please email the Career Services department at *careerservices@digipen.edu*. Please note that employment upon graduation is not guaranteed.

### Disability Support Services

DigiPen Institute of Technology strives to ensure that all students are provided with an equal opportunity to participate in the Institute's programs, courses, and activities. Students desiring special assistance should identify themselves to the Disability Support Services Coordinator and provide current documentation supporting their disability. Students must assist in identifying the proper accommodations they need, and they must negotiate these accommodations at the beginning of each semester. As outlined by the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, DigiPen will provide reasonable accommodations and academic adjustments as long as provisions do not fundamentally alter the nature of the program or the academic requirements that are considered essential to the program of study.

### Graduate Follow Up

The Institute maintains a database of all graduates, and DigiPen alumni are encouraged to report back regarding changes to their professional status. DigiPen hosts an annual reunion at the Game Developer's Conference and extends placement services to all alumni.

# Family Educational Rights and Privacy Act (FERPA)

### Students Rights to Their Academic Records

The Family Educational Rights and Privacy Act (FERPA) reserves for students certain rights with respect to their education records. These rights are:

1. The right to inspect and review the student's education records within 45 days of the day the Institute receives a request for access. Students should submit to the Registrar, Dean, or head of the academic department (or appropriate official) written requests that identify the record(s) they wish to inspect. The Institute official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the Institute official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.

2. The right to request the amendment of the student's education records that the student believes is inaccurate. Students may ask the Institute to amend a record that they believe is inaccurate. They should write the Institute official responsible for the record, clearly identify the part of the record they want changed, and specify why it is inaccurate. If the Institute decides not to amend the record as requested by the student, the Institute will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

3. The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent. One exception, which permits disclosure without consent, is disclosure to school officials with legitimate educational interests. A "school official" is defined as a person employed by the Institute in an administrative supervisory, academic, or support staff position (including law enforcement unit personnel and health staff); a person or company with whom the Institute has contracted (such as an attorney, auditor, or collection agent); a person serving on the Board of Trustees; or a student serving on an official committee (such as a disciplinary or grievance committee) or assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility. Upon request, the Institute discloses education records without consent to officials of another school in which a student seeks or intends to enroll.

4. The right to file a complaint with the U.S. Department of Education concerning alleged failures by the Institute in compliance with the requirements of FERPA. The name and address of the Office that administers FERPA is:

   Family Policy Compliance Office
   U.S. Department of Education
   400 Maryland Avenue, S.W.
   Washington, DC 20202-4605

#### Release of Student Directory Information

The Family Educational Rights and Privacy Act (FERPA) of 1974 protects the privacy of students' education records. However, the following information is considered public or directory information and may be released to anyone unless a student informs the Office of the Registrar that he or she does not wish any information released:

1. Name
2. Local telephone number
3. Institute email address
4. Major field of studies
5. Dates of attendance
6. Degrees and awards received
7. Full-time or part-time enrollment status
8. Number of credits for which a student is registered each semester.
9. Educational institutions attended

#### NO to Release of Information

If a student does not wish to have the Institute release any directory information and/or does not want directory information to appear in any published or electronic Student Directory, he or she may restrict access through the Administration Office. No information will be released on students or to students who have restricted release of directory information, including degrees awarded and dates of attendance.

#### Change from NO to YES

If a student restricted the release of directory information and now wishes to allow this information to be released, he or she must go to the Administration Office and present photo identification and a completed Release/Restrict of Directory Authorization Form.

# Regulation of Conduct and Disciplinary Procedures

The Institute has the right to take appropriate disciplinary action warranted by a student's misconduct. The specific provisions as to offenses, penalties, and disciplinary procedures set out below should not be construed as limiting the general authority of the Institute.

**Rules and Regulations**

1. It is strictly forbidden to bring in or out of the premises any digital storage and any form of memory sticks or optical media, diskettes, video recorders, etc. other than for academic and approved usages which directly apply to courses being taken by the student during the term of this agreement, or for the required purpose of maintaining back-up copies of student-created projects and assignments. Additionally, it is forbidden to bring in any personal computers or software, as well as any video or audio recording equipment, without first agreeing to and signing a Network and Internet Usage Agreement. Students are responsible for guaranteeing that any files transferred to and from DigiPen's equipment are free of malicious viruses or Trojan horses. In respect to the above, students are only allowed to carry in and out of the DigiPen premises data files only and not executable files. This includes student-created executables. Following this policy will greatly reduce the risks of virus infections to the DigiPen network. In order for DigiPen faculty to review and grade projects and assignments, source code must be stored and executables must be generated at DigiPen from the corresponding source code.

2. Students are forbidden from downloading any files from the Internet or installing any software, including but not limited to freeware and/or shareware, without the written approval from a DigiPen faculty member or from DigiPen's IT department. Furthermore, illegal use of the Internet may be prosecuted to the fullest extent of the law.

3. In order to prevent damage to equipment and facilities, food and/or drink are not permitted anywhere within the training areas of the premises.

4. Smoking is not permitted anywhere within the premises, washrooms, elevators, or stairwells.

5. Student ID tags must be worn visibly when on the premises. Lost or stolen ID tags must be reported to Security as soon as possible.

6. All student projects must receive approval from DigiPen's instructors prior to commencement of any production. DigiPen reserves the right to reject ideas or to stop production of any student game, animation, or project for reasons deemed appropriate to DigiPen. The Institute will not allow the production of any student work that contains or makes a direct or indirect reference to any of the following material/subjects:

   - Religious content
   - Religious symbols
   - Pornographic material
   - Excessive violence
   - Sexual and nude content
   - Promotion of illegal substances
   - Promotion of racism or hate
   - Content demeaning to any group of society

7. Plagiarism will not be tolerated. Any student who submits the work of another person as his or her own is considered to have committed plagiarism. Types of work that can be plagiarized include, but are not limited to, source code, artwork, concepts, designs, or other material. Anyone submitting someone else's work without the explicit written permission from the legal owner may have violated the owner's intellectual property rights or copyrights, in addition to committing plagiarism. If any student is unsure as to what constitutes a case of plagiarism, he or she should consult an instructor for clarification.

8. Cheating on an examination will not be tolerated. Using any materials other than those authorized by the examiners during an exam is an example of cheating.

9. Submitting false documents, transcripts, or any other academic credentials to gain admission to DigiPen or to obtain any academic benefit is grounds for expulsion without recourse.

10. Disrupting instructional activities, including making it difficult to proceed with scheduled lectures, seminars, examinations, tests, etc., shall be considered an offense.

11. In the interest of maintaining an environment that is safe and free of violence and/or threats of violence for its employees, students, and visitors, possession of a dangerous weapon is prohibited on property owned by or under the control of DigiPen. Weapons and ammunition are potential safety hazards. Possession, use, or display of weapons or ammunition is inappropriate in an academic community for any reason, except by law enforcement officials. No weapons or ammunition shall be worn, displayed, used, or possessed on campus. Any member of the DigiPen community who violates this policy shall be subject to appropriate disciplinary action up to and including dismissal from DigiPen. Any person who is not a member of the DigiPen community who violates this policy shall be subject to all appropriate procedures and penalties including, but not limited to, the application of the criminal trespass provisions of the law of the State of Washington. Members of the DigiPen community who are aware of any violations of this policy or who have other concerns about safety or weapons should report them to the Student Affairs Director, Dean of Faculty, Senior Vice President of Administration, or the Chief Operating Officer.

12. Evidencing symptoms of alcohol or drug use while on Institute property, or the procurement or possession of alcohol or illegal substances on Institute property, is considered an offense.

13. It is forbidden to damage, remove, or make unauthorized use of the Institute's property or the personal property of faculty, staff, students, or others at the Institute. Without restricting the generality of "property," this includes information, however it may be recorded or stored.

14. It is strictly forbidden to use any equipment in the premises to produce any commercial work. The equipment is only to be used for homework and training purposes. Any attempt to produce commercial work will result in legal action against the offenders.

15. Public areas and equipment of the building must be kept clean. No tampering, moving, defacing, or otherwise altering the premises, equipment, or the building property is allowed.

16. Graffiti, other forms of mural art, or the posting of signs anywhere in the premises and the building without permission of the Administration is not permitted.

17. Office equipment (photocopier, fax, office phone, etc.) is not available for student use.

18. The assault of individuals, whether verbal or physical, including conduct which leads to the physical or emotional injury of faculty, staff, students, or others at the Institute, or which threatens the physical or emotional well-being of faculty, staff, students, or others at the Institute, is considered an offense.

19. In accordance with applicable law, DigiPen prohibits sexual harassment and harassment between faculty/staff and students and between students and students because of race, sex, color, national origin, ancestry, religion, physical or mental disability, veteran status, age, or any other basis protected by federal, state, or local law. Any such harassment may violate the law and will not be tolerated. DigiPen's policy prohibits inappropriate conduct even though it may not reach the legal standard for harassment.

20. It is forbidden to attempt to engage in, aid and abet others to engage in, or attempt to engage in conduct which would be considered an offense.

21. Failing to comply with any penalty imposed for misconduct is considered an offense.

#### Penalties

The penalties that may be imposed, singly or in combination, for any of the above offenses may include, but are not limited to, the following:

1. A failing grade or mark of zero for any course, examination, or assignment in which the academic misconduct occurred.

2. Suspension from the Institute for a specified period of time or indefinitely. Students will not receive credit for courses taken at another institution during a suspension.

3. Reprimand, with the letter placed in the student's file.

4. Restitution, in the case of damage to property or unauthorized removal of property.

5. A notation on the student's permanent record of the penalty imposed.

6. Legal action against the student committing the offense.

#### Warnings

1. The penalty for plagiarism or for cheating is normally suspension from the Institute.

2. Charges filed under federal or state law or the commencement of civil proceedings do not preclude disciplinary measures taken by the Institute.

#### Procedures

Any student suspected or apprehended in the commitment of an offense shall be given the opportunity to explain the incident and, if he or she requests, to meet with department heads, a Student Affairs Officer, or other appropriate person, before the alleged offense is reported to the Discipline Committee.

An alleged instance of student misconduct deemed serious enough for action by the Institute shall be referred to the Discipline Committee. After an investigation and hearing at which the student is invited to appear, the committee reports its decision to the Dean of Faculty. If he or she wishes, the student then has the opportunity to meet with the Dean of Faculty to appeal the decision.

#### Dismissal by the Institute

By written notice to a student, the Institute may, at its sole discretion, dismiss a student at any time if he or she is in default of any of the terms, covenants, or conditions of the Institute. Furthermore, the Institute reserves the right to withdraw a student if he or she is unable to maintain the minimum required GPA in his or her courses at the end of each semester. Upon dismissal, the student shall immediately return to the Institute all materials in his or her possession relating to the program, whether created by the student, other students, or provided by the Institute.

**Appeals**

A student has the right to dispute a disciplinary decision of the Dean of Faculty. A student who wishes to make an appeal must notify the Chief Operating Officer in writing and must provide a full explanation of the reasons for appealing.

Appeal hearings take place before a committee called together by the Chief Operating Officer. A student is entitled to be represented or assisted throughout the appeal process by an advocate who may be a friend, relative, or legal counsel. The student is entitled to explain the reasons for appealing either orally or in writing, and he or she may call witnesses. The Dean of Faculty is also present and puts forth the reasons for the original decision.

The members of the committee may ask questions of both the student and the Dean of Faculty. As soon as possible after the hearing is completed, the Chief Operating Officer will notify the student of the final decision in writing.

# DEGREE PROGRAMS FOR THE ACADEMIC YEAR

# 2010-2011

# Bachelor of Science in Real-Time Interactive Simulation

**Program Overview**

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 Real-Time Interactive Simulation prepares programmers for these industries. Designed and developed by industry experts and DigiPen faculty, the Institute's four-year R.T.I.S. program is a computer science degree that is highly focused on the technical area of graphics and simulations. Participants in the R.T.I.S. program specialize in the skills and tools necessary to create real-time simulations of real-world events.

The B.S. in R.T.I.S. 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, R.T.I.S. 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. R.T.I.S. students gain the experience of designing, programming, and testing a variety of simulations and games, including text-based, scrolling, simulation, and two-dimensional and three-dimensional 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 two-dimensional and three-dimensional 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 multiplayer 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 program will gain the skills required to successfully pursue entry-level careers in the rapidly growing world of computer technologies in general, and computer graphics and simulations in particular. This degree prepares students to work in the computer and video game industry as intermediate-level programmers in graphics, artificial intelligence, networking, or general programming; beginning designers; or engineering tool staff members. Some of the job titles that graduates of this program may aspire to are Solutions Architect, Compatibility/Playability Tester, Game Analyst, Quality Assurance Engineer, Quality Assurance Supervisor, Computer or Software Programmer, Software Engineer, Game Programmer, Engine and Tools Programmer, Game Graphics Programmer, Artificial Intelligence Programmer, Audio Programmer, Web Programmer, or Software/Lead Tester.

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.

**R.T.I.S. Degree Requirements**

*Number of Credits & GPA*

The Bachelor of Science in R.T.I.S. requires completion of at least 154 credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of fifteen weeks each, or a total of four academic years.

*Humanities and Social Sciences Requirement*

Required courses are 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: 14 credits)

*Art Requirement*

Students are required to take ART 210 and two additional credits from the following: ANI 125, ART 400, FLM 115, FLM 151, FLM 275, or ART 410. (Total: 4 credits)

*Computer Science Requirement*

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)

*Mathematics Requirement*

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

*Physics Requirement*

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

*Game Projects Requirement*

The following courses are required: GAM 100, GAM 150, GAM 200, GAM 250, GAT 300, GAM 300, GAM 350, GAM 400, and GAM 450. (Total: 37 credits)

*Electives*

Complete seven to nine credits of elective courses, which students can choose from any department at DigiPen. (Total: 7-9 credits)

*Grade Requirement and Core Courses*

Students must receive a grade of "C-" or higher in all core courses for the R.T.I.S. 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.

**General Education Courses**

The following courses satisfy the general education requirement for the B.S. 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**

Listed on the following page is the recommended course sequence for the Bachelor of Science in Real-Time Interactive Simulation. Please note the following:

- Students must achieve a grade of "C-" or higher in the core courses to earn credit toward this degree.
- Students must receive special permission (*) from their academic advisor to take more than 20 credits in either of their first two semesters.

### Recommended Course Sequence Chart (R.T.I.S.)

| Semester | Course | Course Title | Core | Credits |
|---|---|---|---|---|
| Semester 1 | MAT 140 | Linear Algebra & Geometry | X | 4 |
| | CS 100 | Computer Environment I | X | 3 |
| | CS 100L | Computer Environment Lab I | 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 |
| | ART 210 | Art Appreciation | | 2 |
| | | **Semester Total** | | **20*** |
| Semester 2 | MAT 150 or MAT 180 | Calculus & 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 & Work Communication | | 3 |
| | Humanities Elective | One humanities & social science elective from any three-credit HIS, PSY, or SOS course | | 3 |
| | | **Semester Total** | | **20*** |
| Semester 3 | MAT 200 or MAT 230 | Calculus & Analytic Geometry II or Vector Calculus II | X | 4 |
| | CS 200 | Computer Graphics I | X | 3 |
| | CS 225 | Advanced C/C++ | X | 3 |
| | CS 180 | Operating System I, Man-Machine Interface | X | |
| | GAM 200 | Project II | X | 4 |
| | PHY 200 | Motion Dynamics | X | 3 |
| | | **Semester Total** | | **20** |
| Semester 4 | PHY 250 | Waves, Optics, and Aerodynamics | | 3 |
| | CS 250 | Computer Graphics II | X | 3 |
| | CS 260 | Computer Networks I, Interprocess Communication | X | 3 |
| | CS 280 | Data Structures | X | 3 |
| | GAM 250 | Project II | X | 4 |
| | MAT 250 | Linear Algebra | X | 3 |
| | | **Semester Total** | | **19** |
| Semester 5 | CS 300 | Advanced Computer Graphics I | X | 3 |
| | CS 315 | Low-Level Programming | X | 3 |
| | CS 330 | Algorithm Analysis | X | 3 |
| | MAT 258 | Discrete Mathematics | X | 3 |
| | GAT 300 | 3D Computer Animation Production I | | 3 |
| | GAM 300 | Project III | X | 5 |
| | | **Semester Total** | | **20** |
| Semester 6 | MAT 300 | Curves and Surfaces | X | 3 |
| | CS 350 | Advanced Computer Graphics II | X | 3 |
| | CS 365 | Software Engineering | 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** | | **20** |
| Semester 7 | Art Elective | Select one: ANI 125, ART 400, FLM 115, FLM 151, 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 |
| | | **Semester Total** | | **18-21** |
| 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 |
| | | **Semester Total** | | **16-18** |
| | | **Degree Total** | | **154 minimum** |

*Note: Please see the previous page for an explanation of core courses and the [*].*

# Bachelor of Science in Computer Engineering

**Program Overview**

The Computer Engineering (C.E.) 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 C.E. curriculum integrates the fields of electrical engineering and computer science. This program will uniquely prepare C.E. graduates to design and develop embedded, digital, and computer systems. Graduates with a degree in C.E. will be highly skilled and ideally suited for twenty-first-century industries, including the games industry.

Like students in DigiPen's other degree programs, C.E. 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 C.E. 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 | Application Domains |
|---|---|
| Game Systems<br>Hardware/Electronic Toys<br>Virtual Reality Hardware<br>Human Interface Devices<br>Robotics & Automation<br>Artificial Intelligence<br>Operating Systems<br>Information Systems<br>Telecommunications<br>Signal Processing<br>Control Systems & Instrumentation<br>Multimedia | Aerospace & Avionics<br>Automotive<br>Consumer Electronics<br>Medical Sciences<br>Internet<br>Entertainment<br>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. C.E. 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 C.E. 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 those current 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 DigiPen's Computer Engineering program will have the necessary skills and preparation to work at entry-level positions in computer technologies in general, and embedded systems development in particular. Some of the positions to which graduates from this program may be hired include Software Engineer, Systems Engineer, Embedded Systems Engineer, Design Engineer, Development Engineer, Quality Control Engineer, Computer Architect, Systems Test Engineer, and Video Game Hardware Engineer.

#### Computer Engineering Degree Requirements

*Number of Credits & GPA*

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

*Humanities and Social Science Requirement*

The following courses are required: ENG 110, ART 210, and ECN 350. Students must also take an additional six semester credits of ENG classes numbered 116 and above. Additionally, students must take three semester credits of SOS courses and an additional three semester credits of ART courses. (Total: 20 credits)

*Computer Science Requirement*
The following computer science courses are required: CS 100, CS 100L, CS 120, CS 120L, CS 170, CS 170L, CS 180, CS 225, CS 260, CS 280, CS 315, CS 365, CS 370, and either CS 380 or CS 381. (Total: 36 credits)

*Electrical and Computer Engineering Requirement*
The following courses are required: ECE 200, ECE 210, ECE 220L, ECE 260, ECE 270L, ECE 300, ECE 310L, ECE 350, ECE 360L, ECE 400, ECE 410L, and ECE 460L. (Total: 47 credits)

*Mathematics Requirement*
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)

*Physics Requirement*
PHY 200 and PHY 270 are required. (Total: 6 credits)

*Projects Requirement*
GAM 100 and GAM 150 are required. (Total: 6 credits)

*Electives*
Twelve semester credits of electives of any non-ECE or CS courses and three semester credits from any CS, MAT, or PHY course are required. (Total: 15 credits)

*Grade Requirement 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.)

**General Education Courses**
The following courses satisfy the general education requirement for the B.S. in Computer Engineering: ENG 110 (3), ENG electives (6), SOS elective (3), ART 210 (2), ART elective (3), MAT 150 or MAT 180 (4), PHY 200 (3), ECN 350 (3), and a Humanities and Social Sciences elective (3), for a total of 30 credits.

**Recommended Course Sequence**
Listed on the following page is the recommended course sequence for the Bachelor of Science in Computer Engineering. Please note the following:

- Students must achieve a grade of "C-" or higher in the core courses to earn credit toward this degree.
- Students must receive special permission (*) from their academic advisor to take more than 20 credits their first semester and 17 credits their second semester.

### Recommended Course Sequence Chart (C.E.)

| Semester | Course | Course Title | Core | Credits |
|---|---|---|---|---|
| Semester 1 | MAT 140 | Linear Algebra & Geometry | X | 4 |
| | 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 | | 3 |
| | ENG 110 | Composition | | 3 |
| | ART 210 | Art Appreciation | | 2 |
| | | **Semester Total** | | **20*** |
| 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 180 | Operating System I, Man-Machine Interface | X | 3 |
| | GAM 150 | Project I | | 3 |
| | MAT 258 | Discrete Mathematics | X | 3 |
| | | **Semester Total** | | **17*** |
| Semester 3 | MAT 200 or MAT 230 | Calculus and Analytic Geometry II or Vector Calculus II | X | 4 |
| | CS 225 | Advanced C/C++ | X | 3 |
| | CS 315 | Low-Level Programming | X | 3 |
| | ECE 210 | Digital Electronics I | X | 4 |
| | ECE 220L | Introduction to Robotics | X | 3 |
| | PHY 200 | Motion Dynamics | X | 3 |
| | | **Semester Total** | | **20** |
| Semester 4 | MAT 256 | Introduction to Differential Equations | X | 3 |
| | CS 280 | Data Structures | X | 3 |
| | ECE 200 | Electric Circuits | X | 3 |
| | ECE 260 | Digital Electronics II | X | 4 |
| | ECE 270L | Real-Time Operating Systems | X | 4 |
| | PHY 270 | Electricity and Magnetism | X | 3 |
| | | **Semester Total** | | **20** |
| Semester 5 | CS 260 | Computer Networks I, Interprocess Communication | X | 3 |
| | CS 380 or CS 381 | Artificial Intelligence for Games or Machine Intelligence | X | 3 |
| | ECE 300 | Embedded Microcontroller Systems | X | 3 |
| | ECE 310L | CE Project III: Gaming System | X | 5 |
| | MAT 225 | Calculus and Analytic Geometry III | X | 3 |
| | Elective | Any course from the Department of Humanities and Social Sciences | | 3 |
| | | **Semester Total** | | **20** |
| Semester 6 | MAT 340 | Probability and Statistics | X | 3 |
| | CS 365 | Software Engineering | X | 3 |
| | CS 370 | Computer Imaging | X | 3 |
| | ECE 350 | Control Systems | X | 3 |
| | ECN 350 | Engineering Economics | | 3 |
| | ECE 360L | CE Project IV: Gaming System | X | 5 |
| | | **Semester Total** | | **20** |
| Semester 7 | ECE 400 | Motors and Sensors | X | 3 |
| | ART Elective | Any ART course numbered 100 and above | | 3 |
| | English Elective | One ENG elective chosen from ENG 116 or higher | | 3-4 |
| | ECE 410L | CE Senior Project | X | 5 |
| | Elective | Any elective (excluding ECE and CS courses) | | 3 |
| | | **Semester Total** | | **17-18** |
| Semester 8 | English Elective | One ENG elective chosen from ENG 116 or higher | | 3-4 |
| | ECE 460L | CE Senior Project | X | 5 |
| | Social Science Elective | Any SOS course | | 3 |
| | Electives | Any two electives (excluding ECE and CS courses) | | 6 |
| | Elective | An elective in CS, MAT, or PHY | X | 3 |
| | | **Semester Total** | | **20-21** |
| | | **Degree Total** | | **154 minimum** |

*Note: Please see the previous page for an explanation of core courses and the [*].*

# Bachelor of Fine Arts in Production Animation

**Program Overview**

As the animation industry matures, 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 animation skills. Industry-quality standards continue to rise, and competition for entry-level positions demands that animators possess sophisticated skill sets before they can even begin their careers. Studios seek animators 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.

Despite these changes, animation remains a viable career opportunity. 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 animation education.

The broad scope of these demands presents a series of significant academic challenges. Most current animation 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 animators 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 Bachelor of Fine Arts in Production Animation seeks to address these needs. Examples of student projects can be found in the 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 animation. This base allows students to gain an overview of the profession and provides long-term adaptability.
- An area of production specialization and focus. This enables students to target a specific sector of the industry upon graduation. Each student will produce a thesis portfolio to support this focus.
- Strong foundational skills and a thorough grounding in applied drawing. This will include an understanding of how to maintain and continually enhance one's drawing skill throughout his or her career, in addition to building the habits to sustain this growth.
- 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. Finally, they will understand the stresses of production and methods for positively managing this stress.
- 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.

This degree prepares a graduating student for a career in digital three-dimensional animation, digital two-dimensional animation, and animation pre-production. Some of the careers for which graduates of the B.F.A. in Production Animation are trained include Props and Environment Modelers, Texture Artists, Level Designers, Character Modelers, Character Riggers, Character Animators, 3D Lighting and Camera Design, Effects Animator, Conceptual Illustration and Character Design, and Storyboard Artists.

**Production Animation Degree Requirements**

*Number of Credits & GPA*

The Bachelor of Fine Arts in Production Animation requires completion of at least 144 credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of fifteen weeks each, or four academic years.

*Humanities and Social Science Requirements*

The following courses are required: LAW 115, SOS 115, ENG 116, and ENG 315. (Total: 14 credits)

*Art Requirement*

The following art courses are required: ART 101, ART 115, ART 125, ART 151, ART 201, ART 225, ART 251, ART 300, ART 350, ART 401, and ART 450. (Total: 34 credits)

*Animation Requirement*

The following animation courses are required: ANI 101, ANI 125, ANI 151, ANI 300, ANI 350, and ANI 400. (Total: 18 credits)

*Computer Graphics Requirement*

The following computer graphics courses are required: CG 201, CG 225, CG 251, CG 275, CG 300, and CG 350. (Total: 18 credits)

*Film Requirement*

The following film courses are required: FLM 115, FLM 151, FLM 201, FLM 250, and FLM 275. (Total: 15 credits)

*Science Requirement*

The following courses are required: CS 115, PHY 115, BIO 100, BIO 150, BIO 200. (Total: 15 credits)

*Projects Requirement*

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)

*Electives*

Students must take one of these two courses: CG 400 or ART 401. (Total: 3 credits)

*Grade Requirement and Core Courses*

Students must receive a grade of "C-" or higher in all core courses for the Production Animation major. (In a non-core course, a grade of "D" or higher is considered passing.) The core courses are all of the art, animation, computer graphics, film, and projects requirements noted above, except for ART 115, FLM 115, CG 350, ART 401, and FLM 275. BIO 100, BIO 150, BIO 200, ENG 116, ENG 315, CS 115, and SOS 115 are also core courses for this major.

**General Education Courses**

The following courses satisfy the general education requirement for the B.F.A. in Production Animation: ART 115 (4), BIO 100 (3), BIO 150 (3), BIO 200 (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 36 credits.

### Recommended Course Sequence Chart (B.F.A.)

| 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 115 | Art and Technology | | 4 |
| | BIO 100 | Visual Perception | X | 3 |
| | ENG 116 | Storytelling | X | 4 |
| | FLM 115 | History of Film and Animation | | 3 |
| | | **Semester Total** | | **20** |
| **Semester 2** | ANI 125 | Acting for Animation | X | 3 |
| | ANI 151 | Advanced Animation - Theories and Techniques II | X | 3 |
| | ART 125 | Tone, Color, and Composition | X | 3 |
| | ART 151 | Basic Life Drawing | X | 3 |
| | BIO 150 | Human Muscular, Skeletal, and Kinetic Anatomy | X | 3 |
| | FLM 151 | Visual Language and Film Analysis | X | 3 |
| | | **Semester Total** | | **18** |
| **Semester 3** | ART 201 | Advanced Life Drawing | X | 3 |
| | BIO 200 | Animal Muscular, Skeletal, and Kinetic Anatomy | X | 3 |
| | CG 201 | Two-Dimensional Raster Graphics and Animation | X | 3 |
| | CG 225 | Introduction to 3D Animation | X | 3 |
| | PRJ 201 | Two-Dimensional Animation Production | X | 5 |
| | | **Semester Total** | | **17** |
| **Semester 4** | ART 225 | Three-Dimensional Design and Sculpture | X | 3 |
| | ART 251 | Character Design | X | 3 |
| | CG 251 | Two-Dimensional Vector Graphics and Animation | X | 3 |
| | CG 275 | Three-Dimensional Character Animation | X | 3 |
| | PRJ 251 | Two-Dimensional Vector Animation Production | X | 5 |
| | | **Semester Total** | | **17** |
| **Semester 5** | ANI 300 | Acting through an Interface | X | 3 |
| | ART 300 | Perspective, Backgrounds, and Layouts | X | 3 |
| | CG 300 | Three-Dimensional Environment and Level Design | X | 3 |
| | ENG 315 | Story through Dialogue | X | 4 |
| | ART 350 | Storyboards | X | 3 |
| | PRJ 300 | Limited-Scope 3D Production | X | 5 |
| | | **Semester Total** | | **21** |
| **Semester 6** | ANI 350 | Voice Acting for Animation | X | 3 |
| | PHY 115 | Introduction to Applied Math and Physics | | 3 |
| | CG 350 | Graphics for Gaming | | 3 |
| | FLM 201 | Cinematography | X | 3 |
| | PRJ 350 | Three-Dimensional Animation Production | X | 5 |
| | | **Semester Total** | | **17** |
| **Semester 7** | ART 401 | Conceptual Illustration and Visual Development | | 3 |
| | FLM 250 | Digital Post-Production | X | 3 |
| | FLM 275 | Fundamentals of Music & Sound Design | | 3 |
| | ART 450 | Portfolio | X | 3 |
| | PRJ 400 | Capstone Project I | X | 5 |
| | | **Semester Total** | | **17** |
| **Semester 8** | ANI 400 | Cinematic Animation | X | 3 |
| | SOS 115 | Media and Ethics: A Social Science Perspective | X | 3 |
| | CS 115 | Introduction to Scripting and Programming | X | 3 |
| | LAW 115 | Introduction to Intellectual Property and Contracts | | 3 |
| | PRJ 450 | Capstone Project II | X | 5 |
| | | **Semester Total** | | **17** |
| | | **Degree Total** | | **144 minimum** |

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

# Game Design Degree Programs

**Overview**

The designers and creators of electronic and digital entertainment fill a unique role that combines art, technology, innovation, storytelling, history, psychology, and many other disciplines. This multidisciplinary program leads to two degrees: the Bachelor of Science in Game Design (B.S.G.D.) and the Bachelor of Arts in Game Design (B.A.G.D.). At DigiPen, the B.S.G.D. is designed to educate students to become technical game designers with the skills necessary to design levels, program, script, and work in this dynamic field. On the other hand, the B.A.G.D. program prepares students to become artistic level designers with the skills to create worlds, levels, and the art for these. Students graduating with either degree will be prepared to begin working in the computer software and video games industries.

Students in the Game Design degree programs will learn how to apply the software, other tools, materials, and processes used in this industry to challenging problems that practitioners in the field regularly encounter. They will gain experience in evaluating and creating effective game proposals. Additionally, they will learn and practice verbal communication skills typically used when working in the industry. Like other DigiPen degree programs, the Game Design degrees emphasize the development of effective team-work skills through team projects and self- and peer-evaluations. Senior students will develop and subsequently present capstone team projects to DigiPen faculty and personnel from local businesses. Graduates of this program will be capable of designing industry-quality games, which can be submitted to recognized competitions. They will also have attained a level of proficiency expected of students entering graduate-degree programs.

# Bachelor of Science in Game Design

**Program Overview**

This degree program prepares graduates to design electronic and digital entertainment. Graduates will also be able to use a variety of languages to program computer software. Additionally, they will gain experience designing, building, and using a range of computer tools. Graduates will be well versed in game design theory, level design, artificial intelligence design, and general programming skills. This interdisciplinary degree provides them with a solid grounding in the humanities and social sciences, including art history, world history, law, and economics.

Graduates with this degree will be capable of designing, modeling, and balancing 2D and 3D levels for games. They will develop a foundational understanding of art and architectural design. The B.S.G.D. program also stresses the importance of being able to write computer programs in core languages such as C and C++, as well as having an overview of the technology used in game development, including the uses of scripting languages and other tools. The game industry requires versatile and knowledgeable personnel, and most game designer job descriptions list skills that include scripting and tuning as well as art design. At DigiPen, this degree program not only trains students to be programmers, but it also exposes them to the tools commonly used in the industry by artists, designers, and producers. These tools include proprietary scripting languages, level/map editors, and databases. In addition to these tools, students will learn techniques related to interactive storytelling and design documentation.

Graduates of this degree program will be prepared to work in the video and electronic game industry as level designers at the intermediate level, entry-level game designers, entry-level programmers, entry-level AI programmers, and beginning designers. Some of the job titles that graduates of this program can expect to attain are level scripter, level designer, game designer, design director, creative director, tools programmer, gameplay programmer, and game developer.

**B.S.G.D. Degree Requirements**

*Number of Credits & GPA*

The Bachelor of Science in Game Design (B.S.G.D.) requires completion of at least 147 semester credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of fifteen weeks each, or four academic years.

*Humanities and Social Science Requirement*

The following courses are required: COM 150, ENG 110, HIS 100, HIS 150, LAW 115, MGT 450, and PSY 101. One additional English course (three credits) numbered higher than ENG 110 must be taken. One course (three credits) must be selected from any Social Sciences (SOS) course offered at DigiPen. (Total: 26 credits)

*Art Requirement*

The following courses are required: ART 101, ART 115, ART 125, ART 260, ART 310, CG 201 or CG 202, and FLM 151. (Total: 22 credits)

*Projects Requirement*

The following courses are required: GAM 100, GAT 110, GAT 210, GAT 211, GAT 240 or CS 260, GAT 250, GAT 251, GAT 300, GAT 305, GAT 310, GAT 350, and GAT 480. One course (three credits) must be selected from any GAT or CS course offered at DigiPen. Students must also complete ten credits (two courses) from one of these three pairings: GAM 300 and GAM 350, GAM 301 and GAM 351, or GAM 400 and GAM 450. (Total: 47 credits)

*Computer Science Requirement*

The following courses are required: CS 100, CS 100L, CS 120, CS 120L, CS 170, CS 170L, CS 225, CS 200 or CS 251, CS 280 or CS 311, CS 365, and CS 380 or CS 381. One additional course must be taken from the following: either CS 180 or CS 230. (Total: 30 credits)

*Mathematics Requirement*

The following courses are required: MAT 140, MAT 150 or MAT 180, MAT 200 or MAT 230, and MAT 258. (Total: 15 credits)

*Physics Requirement*

Two courses are required: PHY 200 and PHY 200L. (Total: 4 credits)

*Electives*

Complete three credits of an elective course to be chosen from any department at DigiPen. (Total: 3 credits)

*Grade Requirements and Core Courses*

Students must receive a grade of "C-" or higher in all core courses for the B.S.G.D. major. (In a non-core course, a grade of "D" is considered passing.) The core courses are defined as follows: all courses taken to fulfill the Projects, Mathematics, and Computer Sciences requirements (GAM, GAT, MAT, and CS courses).

**General Education Courses**

The following courses satisfy the general education requirement for the B.S.G.D.: COM 150 (3), ART 101 (3), ART 115 (4), ENG 110 (3), HIS 100 (3), HIS 150 (3), LAW 115 (3), MAT 150 or MAT 180 (4), PHY 200 (3), and PSY 101 (3). One additional English course (three credits) numbered higher than ENG 110 must be taken. One course (three credits) must be selected from any Social Sciences (SOS) course offered at DigiPen. These general education courses total 38 credits.

**Recommended Course Sequence**

Listed on the following page is the recommended course sequence for the B.S.G.D. Please note the following:

- Students must receive a "C-" or higher in the core courses to earn credit toward this degree.
- Students must receive special permission (*) from their academic advisor to take more than 19 credits their first semester and 17 credits their second semester.

### Recommended Course Sequence Chart (B.S.G.D.)

| Semester | Course | Course Title | Core | Credits |
|---|---|---|---|---|
| Semester 1 | ART 115 | Art and Technology | | 4 |
| | GAM 100 | Project Introduction | X | 3 |
| | 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 |
| | MAT 140 | Linear Algebra and Geometry | X | 4 |
| | | **Semester Total** | | **19*** |
| Semester 2 | GAT 110 | Game History | X | 3 |
| | GAT 210 | Game Mechanics I | X | 3 |
| | ART 101 | The Language of Drawing | | 3 |
| | 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 |
| | | **Semester Total** | | **17*** |
| Semester 3 | GAT 250 | Two-Dimensional Level Design - Introduction | X | 3 |
| | CG 202 | Two-Dimensional Raster Graphics and Animation for Designers | | 3 |
| | ENG 110 | Composition | | 3 |
| | GAT 211 | Game Mechanics II | X | 3 |
| | CS 225 | Advanced C/C++ | X | 3 |
| | MAT 200 or MAT 230 | Calculus and Analytic Geometry II or Vector Calculus II | X | 4 |
| | | **Semester Total** | | **19** |
| Semester 4 | GAT 251 | Two-Dimensional Level Design - Documentation | X | 3 |
| | PSY 101 | Introduction to Psychology | | 3 |
| | ART 125 | Tone, Color, and Composition | | 3 |
| | FLM 151 | Visual Language and Film Analysis | | 3 |
| | MAT 258 | Discrete Mathematics | X | 3 |
| | CS 230 | Game Implementation Techniques | X | 3 |
| | | **Semester Total** | | **18** |
| Semester 5 | GAT 305 | Three-Dimensional Level Design I | X | 3 |
| | HIS 100 | Introduction to World History I | | 3 |
| | GAT 240 | Technology for Designers | X | 3 |
| | GAT 300 | Three-Dimensional Computer Animation Production I | X | 3 |
| | ART 310 | Architectural Spaces, Design, and Lighting I | | 3 |
| | PHY 200 | Motion Dynamics | | 3 |
| | PHY 200L | Motion Dynamics Lab | | 1 |
| | | **Semester Total** | | **19** |
| Semester 6 | GAT 310 | Three-Dimensional Level Design II | X | 3 |
| | ART 260 | Graphic Design, User Experience, and Input | | 3 |
| | COM 150 | Interpersonal and Work Communication | | 3 |
| | HIS 150 | Introduction to World History II | | 3 |
| | GAT 350 | 3D Computer Animation Production II | X | 3 |
| | CS 311 | Introduction to Databases | X | 3 |
| | | **Semester Total** | | **18** |
| Semester 7 | Any GAT or CS course | GAT or CS elective | X | 3 |
| | One of: GAM 300, GAM 301, or GAM 400 | Project III, Project for Game Designers, or Project IV | X | 5 |
| | GAT 480 | Senior Portfolio | X | 1 |
| | CS 380 | Artificial Intelligence for Games | X | 3 |
| | Elective | An elective of the student's choice from any department at DigiPen | | 3 |
| | CS 251 | Introduction to Computer Graphics | X | 3 |
| | | **Semester Total** | | **18** |
| Semester 8 | One of: GAM 350, GAM 351, or GAM 450 | Project III, Project for Game Designers, or Project IV | X | 5 |
| | LAW 115 | Introduction to Intellectual Property and Contracts | | 3 |
| | ENG Elective | Any three-credit ENG course higher than ENG 110 | | 3 |
| | SOS Elective | Any three-credit SOS course | | 3 |
| | CS 365 | Software Engineering | X | 3 |
| | MGT 450 | Product Management | | 2 |
| | | **Semester Total** | | **19** |
| | | **Degree Total** | | **147 minimum** |

*Note: Please see the previous page for an explanation of core courses and the [*].*

# Bachelor of Arts in Game Design

**Program Overview**

This degree program prepares graduates to design electronic and digital entertainment and to be able to create video game art assets, including level art, world art, backgrounds, models, textures, and architecture. Graduates will be well versed in game design theory, level design, artificial intelligence design, and general art skills. This interdisciplinary degree provides them with a solid grounding in the humanities and social sciences, including art history, world history, law, and economics.

Graduates with this degree will be capable of designing, modeling, and texturing 3D and 2D levels. They will have a strong foundational understanding of architecture, staging, and set design. At a minimum, they will be able to design levels and worlds for a variety of genres, including urban, rural, fantasy, technological, or science fiction. Graduates of this degree program will also know basic programming logic and be capable of designing artificial intelligence, triggers, and behaviors. Additionally, they will be able to use existing scripting languages and, more importantly, will be able to learn new scripting languages quickly. To complement these skills, students will learn techniques of interactive storytelling and design documentation.

This degree prepares students for a career in digital three-dimensional modeling of environments, digital design of buildings and settings, design pre- and post-production. Graduates of this degree program will be prepared to work as entry-level level designers, intermediate-level level designers, entry-level environmental artists, beginning designers, and beginning modelers. Some of the job titles that graduates of this program can expect to attain are level designer, environmental artist, modeler, artist, game designer, design director, and creative director.

### B.A.G.D. Degree Requirements

*Number of Credits & GPA*

The Bachelor of Arts in Game Design (B.A.G.D.) requires completion of at least 142 semester credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of fifteen weeks each, or four academic years.

*Humanities and Social Science Requirement*

The following courses are required: COM 150, ENG 110, HIS 100, HIS 150, LAW 115, MGT 450, and PSY 101. One additional English course (three credits) numbered higher than ENG 110 must be taken. One course (three credits) must be selected from any Social Sciences (SOS) course offered at DigiPen. (Total: 26 credits)

*Art Requirement*

The following courses are required: ANI 101, ANI 151, ART 101, ART 115, ART 125, ART 260, ART 310, ART 360, CG 201 or CG 202, CG 225, CG 275, CG 301, CG 320, CG 340, and FLM 151. Two additional art electives (six credits), selected from any courses offered by the Department of Fine Arts and Animation, are required. (Total: 52 credits)

*Projects Requirement*

The following courses are required: GAM 100, GAT 110, GAT 210, GAT 211, GAT 240, GAT 250, GAT 251, GAT 305, GAT 310, and GAT 480. One course (three credits) must be selected from any GAT or CS course offered at DigiPen. Students must also complete ten credits (two courses) from one of these three pairing: GAM 300 and GAM 350, GAM 301 and GAM 351, or GAM 400 and GAM 450. (Total: 41 credits)

*Mathematics Requirement*

Students must take MAT 100. (Total: 4 credits)

*Science Requirement*

Students must take PHY 115 or PHY 200. An additional three-credit (minimum) science course must be selected from the following: BIO 100, BIO 150, BIO 200, BIO 225, PHY 250 and PHY 250L, PHY 270 and PHY 270L, or PHY 290 and PHY 290L. (Total: 6 credits)

*Computer Science Requirement*

The following courses are required: CS 101, CS 115, and CS 275. (Total: 7 credits)

*Electives*

Complete six credits of elective courses to be chosen from any department at DigiPen. (Total: 6 credits)

*Grade Requirements and Core Courses*

Students must receive a grade of "C-"or higher in all core courses for the B.A.G.D. major. (In a non-core course, a grade of "D" is considered passing.) The core courses are defined as follows: all courses taken to fulfill the Projects and Art requirements (GAM, GAT, ART, ANI, CG, and FLM courses).

### General Education Courses

The following courses satisfy the general education requirement for the B.A.G.D.: ART 101 (3), ART 115 (4), COM 150 (3), ENG 110 (3), HIS 100 (3), HIS 150 (3), LAW 115 (3), MAT 100 (4), PHY 115 (3), and PSY 101 (3). One additional English course (three credits) numbered higher than ENG 110 must be taken. One course (three credits) must be selected from any Social Sciences (SOS) course offered at DigiPen. (Total: 38 credits)

### Recommended Course Sequence

Please note that students must receive a "C-" or higher in the core courses to earn credit toward this degree. Also, students must receive special permission (*) from their academic advisor to take more than 17 credits their first semester and 19 credits their second semester.

### Recommended Course Sequence Chart (B.A.G.D.)

| Semester | Course | Course Title | Core | Credits |
|---|---|---|---|---|
| **Semester 1** | ART 115 | Art and Technology | X | 4 |
| | CS 115 | Introduction to Scripting and Programming | | 3 |
| | GAM 100 | Project Introduction | X | 3 |
| | ANI 101 | Introduction to Animation - Theories and Techniques I | X | 3 |
| | CS 101 | Introduction to Computer Environment | | 1 |
| | ART 101 | The Language of Drawing | X | 3 |
| | | **Semester Total** | | **17*** |
| **Semester 2** | GAT 110 | Game History | X | 3 |
| | GAT 210 | Game Mechanics I | X | 3 |
| | ART 125 | Tone, Color, and Composition | X | 3 |
| | FLM 151 | Visual Language and Film Analysis | X | 3 |
| | ANI 151 | Advanced Animation - Theories and Techniques II | X | 3 |
| | MAT 100 | Pre-Calculus with Linear Algebra and Geometry | | 4 |
| | | **Semester Total** | | **19*** |
| **Semester 3** | GAT 250 | Two-Dimensional Level Design - Introduction | X | 3 |
| | CG 201 | Two-Dimensional Raster Graphics and Animation | X | 3 |
| | ART 310 | Architectural Spaces, Design, and Lighting I | X | 3 |
| | GAT 211 | Game Mechanics II | X | 3 |
| | CG 225 | Introduction to 3D Animation | X | 3 |
| | ENG 110 | Composition | | 3 |
| | | **Semester Total** | | **18** |
| **Semester 4** | GAT 251 | Two-Dimensional Level Design - Documentation | X | 3 |
| | PSY 101 | Introduction to Psychology | | 3 |
| | PHY 115 | Introduction to Applied Math and Physics | | 3 |
| | CG 275 | Three-Dimensional Character Animation | X | 3 |
| | ART 360 | Architectural Spaces, Design, and Lighting II - Period Styles | X | 3 |
| | CS 275 | Scripting Languages | | 3 |
| | | **Semester Total** | | **18** |
| **Semester 5** | GAT 305 | Three-Dimensional Level Design I | X | 3 |
| | HIS 100 | Introduction to World History I | | 3 |
| | GAT 240 | Technology for Designers | X | 3 |
| | SOS Elective | Any three-credit SOS course | | 3 |
| | CG 301 | Environments and Backgrounds | X | 3 |
| | CG 320 | Materials and Lighting | X | 3 |
| | | **Semester Total** | | **18** |
| **Semester 6** | GAT 310 | Three-Dimensional Level Design II | X | 3 |
| | ART 260 | Graphic Design, User Experience, and Input | X | 3 |
| | COM 150 | Interpersonal and Work Communication | | 3 |
| | HIS 150 | Introduction to World History II | | 3 |
| | Art Elective | Any three-credit course offered by the Art Department | X | 3 |
| | CG 340 | Game and Cinematic Textures | X | 3 |
| | | **Semester Total** | | **18** |
| **Semester 7** | GAT or CS Elective | Any GAT or CS course | X | 3 |
| | One of: GAM 300, GAM 301, or GAM 400 | Project III, Project for Game Designers, or Project IV | X | 5 |
| | GAT 480 | Senior Portfolio | X | 1 |
| | Elective | An elective of the student's choice from any department at DigiPen | | 3 |
| | Elective | An elective of the student's choice from any department at DigiPen | | 3 |
| | Art Elective | Any three-credit course offered by the Art Department | X | 3 |
| | | **Semester Total** | | **18** |
| **Semester 8** | One of: GAM 350, GAM 351, or GAM 450 | Project III, Project for Game Designers, or Project IV | X | 5 |
| | LAW 115 | Introduction to Intellectual Property and Contracts | | 3 |
| | ENG Elective | Any three-credit ENG course higher than ENG 110 | | 3 |
| | MGT 450 | Product Managements | | 2 |
| | Science Elective | Choose one of the following: BIO 100, BIO 150, BIO 200, BIO 225, PHY 250 and PHY 250L, PHY 270 and PHY 270L, or PHY 290 and PHY 290L | | 3 |
| | | **Semester Total** | | **16** |
| | | **Degree Total** | | **142 minimum** |

*Note: Please see the previous page for an explanation of core courses and the [*].*

# Minors

To obtain a minor at DigiPen, undergraduates must satisfy criteria set out by the department awarding the minor. The following minors are available:

- Minor in Electrical and Computer Engineering
- Minor in English
- Minor in Game Design
- Minor in Mathematics
- Minor in Physics

**Electrical and Computer Engineering Minor**

Digital games are limited by the hardware that contains them. Understanding and creating hardware and software at the lowest level enables game designers and programmers to interact with the player in a fundamentally different manner. Students that complete a minor in computer engineering have a working knowledge of systems and circuits and have worked on both hardware and software projects.

Students must pass all of the following courses with a "C-" or better to earn a minor in computer engineering: CS 100, CS 100L, CS 120, CS 120L, CS 180, CS 280, CS 315, CS 365, ECE 210, MAT 150 or MAT 180, MAT 200 or MAT 230, PHY 200, and 9 credits of CE electives. CE electives must be selected from the following list: ECE 200, ECE 220L, ECE 260, ECE 270L, ECE 300, ECE 310L, and PHY 270.

**English Minor**

DigiPen's Department of Humanities and Social Sciences offers a diverse array of English courses encompassing literature, expositional writing, and creative writing. Our literature courses provide critical inquiry into great writings from our earliest myths and epics to contemporary post-modern works. Our writing courses offer students the opportunity to work in the genres of nonfiction, fiction, poetry, screenwriting, graphic storytelling, and video games.

The minor in English provides a structured way for students to develop and hone the analytical and creative skills needed to articulate their experience, to support their opinions, and to write compelling stories. Additionally, students who complete the English minor will acquire an understanding of human endeavor as expressed in literature in various forms and historical periods.

To earn an English minor, students must complete a minimum of 18 credits in ENG courses with a C- or better. Except for ENG 320 and ENG 450, all ENG courses count toward the English minor. Students must also take at least one upper-division ENG course numbered 300 or above.

#### Game Design Minor

To earn a game design minor at DigiPen, students must complete a block of 21 credits satisfying the following:

- GAM 100.
- One of the following courses: CS 380 or CG 300.
- Five of the following courses: GAT 210, GAT 211, GAT 250, GAT 251, GAT 305, GAT 310, ART 260, ART 300, ART 310, ART 401, or FLM 201. AT least 9 credits must be from GAT courses.

#### Mathematics Minor

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

- The courses are taken from MAT 140 or higher (any MAT course excluding MAT 100).
- PHY 300 may substitute for one of the MAT courses.
- Six credits must be numbered 300 or higher.
- At least nine credits must be taken at DigiPen.
- All credits must be earned with a grade of "C-" or better.

#### Physics Minor

Creating realistic simulations requires knowledge of the underlying physical laws of the universe. In modern simulations, for example, physics is the cornerstone around which the engine is built. Translating a set of natural laws into rules for the computer requires not only the ability to understand these laws, but also the ability to synthesize these laws given the restrictions of modern computing. All students with an R.T.I.S. or C.E. degree will understand the basic physical rules of simulations, but the students with a minor in physics will have a proven ability to recreate those rules.

Students that minor in physics will also have a wider exposure to the place of physics in the modern world, from electromagnetism to quantum mechanics. They will be introduced to many of the quandaries facing the modern physical sciences.

Students must complete 18 credits in PHY courses numbered 200 and above with a "C-" or better to earn a physics minor. Additionally, students must achieve a grade "C-" or better in MAT 100 or MAT 140, MAT 150 or MAT 180, MAT 200 or MAT 230, and MAT 225 or MAT 250.

# Master of Science in Computer Science

**Program Overview**

Driven by thriving technology and innovations, the interactive real-time simulation software and video game industry is exciting and dynamic. Currently topping 21 billion dollars in the U.S.A. and 40 billion dollars worldwide, the industry is an active research field 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, on-line, wireless devices, etc.) has been rising. The trend is conservatively estimated to be growing at the rate of 15% per year. Three-dimensional computer graphics, artificial intelligence (AI), networking, and distributed computing technology continue to drive innovations in both hardware and software.

Gaming companies increasingly demand leading programmers or engineers with an in-depth comprehension of and a solid background in mathematics, physics, real-time rendering, AI, 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 four-year bachelor's degree program is inadequate and limits them from advancing professionally. More extensive education at a postgraduate level is needed.

DigiPen Institute of Technology has awarded the Bachelor of Science in R.T.I.S. since 2000. This degree provides both academic and practical training for programming computer games. It has been highly successful, and DigiPen has received recognition for this achievement. Building on this success, the Institute now offers a Master of Science in Computer Science to meet this postgraduate education need. On June 6, 2006, the ACCSCT granted the Institute accreditation for this graduate degree. 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 some game-industry experience

The M.S. in C.S. 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, 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 (level of details, 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, including virtual reality, illumination and shading algorithms, animation techniques, surface representation and rendering, volume visualization and morphing algorithms, geometry, modeling, 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, and networking are in great demand. These include the computer game, aerospace, and medical industries. Graduates of this program may attain occupations as software engineers, engine and tools programmers, game graphics programmers, and solution architects.

**Computer Science Degree Requirements**

*Number of Credits & GPA*

The Master of Science in C.S. requires completion of at least 37 semester credits with a cumulative GPA of 3.0 or better. The program typically spans four semesters of fifteen weeks each, or two academic years. For candidates with bachelor's degrees in computer science but a lack of experience in computer graphics or mathematics, some articulation classes may be required.

*Computer Science Requirement*

CS 525, CS 529, CS 541, CS 560 (or CS 581), CS 562 (or CS 582), and CS 598 are required. (Total: 16 credits)

*Mathematics Requirement*

At least one MAT course numbered 500 or above is required. (Total: 3 credits)

*Projects Requirement*

GAM 541, GAM 550, and GAM 551 are required. (Total: 9 credits)

*Elective Requirement*

Nine credits from the following courses must be completed, and at least six credits of the chosen courses must be CS courses if the student selects to take Thesis Option C (extra course work): CS 500, CS 530, CS 560, CS 561, CS 562, CS 570, CS 580, CS 581, CS 582, CS 590, CS 599, CS 601, CS 602, PHY 500, PHY 550, MAT 500, MAT 550, MAT 551, MAT 552, MAT 553, MAT 554, MAT 555, MAT 556, MAT 557, MAT 559, MAT 561, MAT 562, and MAT 599. (Total: 9 credits)

*Thesis or Extra Course Requirement*

Six credits of either thesis or extra courses must be completed. For research and project theses, CS 601 and CS 602 are required. For extra course work, two additional electives (six credits) not used in satisfying the Elective Requirement and a comprehensive exam must be completed. (Total: 6 credits)

*Waived Required Courses*

Required courses can be waived on a case-by-case basis for qualified students. The academic advisor will decide on whether or not to approve these requests.

**Length Restrictions**

Full-time students in the M.S. in C.S. degree program must complete the requirements for the degree in 3 years or 36 months. Part-time students must complete the requirements for the degree in 5 years or 60 months. Students must remain in continuous matriculation throughout the duration of their degree program.

**Graduation Requirements**

Graduation from the M.S. in C.S. degree program requires:

- A cumulative grade point average of 3.0 or better.
- Satisfactory achievement of all required coursework.

For students with the thesis option:

- Successful defense of one's master's thesis.
- Submission of two original paper copies and one electronic copy of the thesis with all the required signatures. Submission directions are available in the "Thesis Style Guide" (available in the library).

For students with the extra course option:

- Six credits of elective courses.
- Passing score on the comprehensive exams.

Additionally, the M.S. in C.S. program requires that its graduate students complete a "capstone experience." This is designed to bring reflection and focus to a student's area of concentration and to enhance the skills, methodology, and knowledge learned throughout the degree program. Examples of possible capstone experiences include (but may not be limited to) successful completion of at least one of the following:

- Game project classes GAM 550 and GAM 551.
- Project thesis CS 601 and CS 602.
- Two semesters of externship at a game company.
- Comprehensive exams.

**Thesis Options**

Students in the Master of Science in Computer Science program must select to focus their studies through the completion of one of three different tracks of study: research thesis, project thesis, or extra coursework. The research thesis option is designed for those students who wish to develop analytic research skills and to make an original contribution to the field. The project thesis option allows students to advance their professional career through a hands-on experience or practical application of their study. The extra coursework option is intended for those preferring extended knowledge and broader skills in computer science or a related discipline.

All M.S. in C.S. students are required to complete four required courses (12 credits) and four electives (12 credits) at the graduate level, in addition to one of the following options:

*1. Research Thesis Track (CS 601 and CS 602)*
Students choosing this track must identify an area of interest within the discipline of computer science, computer engineering, mathematics, physics, or game production. They shall conduct a literature survey on existing techniques and algorithms in the field, propose an innovative approach to the field, develop the theory and prototypes, and write and defend the thesis.

*2. Project Thesis Track (CS 601 and CS 602)*
This option is similar to the research thesis track. However, instead of an original contribution to the field, the project thesis emphasizes the practical aspect of a specific problem. After surveying the literature in a narrowly focused area of study, students choosing this track shall select existing algorithm(s) to implement. They must also analyze and compare different approaches. This option also requires that students write a technical report and demonstrate the implementation of the algorithm(s) to the committee.

*3. Extra Coursework Track with Comprehensive Exams*
This option allows a student to take two additional electives offered at the graduate level to replace CS 601 and CS 602 along with the satisfactory completion of a comprehensive exam.

The comprehensive examination tests a student's knowledge of basic computer science material and material covered by the chosen concentration area. The exam is based on graduate courses and suitable undergraduate material. The examination will be offered during the final week of every spring semester, but it may be offered during the fall semester upon a student's request. To schedule an examination, the student shall complete the "Comprehensive Examination Request Form" no later than six weeks prior to the end of the semester. The form should be signed by the student and his or her academic advisor.

The comprehensive examination consists of two parts - general and subject. The general part of the examination covers core computer science topics and includes all four of the following:

- Algorithms
- Operating Systems
- Data Structures
- Linear Algebra

The general part also includes one of the following (subject to the advisor's approval):

- Advanced Physically-Based Modeling
- Curves and Surfaces
- Image Processing

The subject part of the examination covers a student's chosen concentration area:

- Artificial Intelligence
- Artificial Intelligence for Video Games
- Introduction to Artificial Introduction
- Graphics
- Advanced Computer Graphics
- Advanced Animation Algorithms

The comprehensive exam will be given over the period of a single day. Each of the two parts of the examination will be given in a separate three-hour period. The student's final grade will be given based on individual performance in each of the two exams. Instructors will provide a syllabus of the material covered by the exam.

The outcome of the comprehensive examination will be one of the following:

- Pass - Student earns a grade of 75% or higher in each of the two parts of the examination.
- Conditional Pass - given in rare borderline cases where a student may need to fulfill additional requirements, such as retaking one part of the examination.
- Fail - Student is required to retake both parts of the examination.

#### Full-Time Status

Full-time enrollment for graduate students consists of nine credits per semester.

**Graduate Student Grading System**

The following system applies to graduate students. If you are an undergraduate student, please refer to "Standards of Progress - Grading System."

A Excellent = 4.0 quality points

A - Excellent = 3.7 quality points

B+ Good = 3.3 quality points

B Good = 3.0 quality points

B- Good = 2.7 quality points

C+ Fair = 2.3 quality points

C Fair = 2.0 quality points.*

C- Fair = 1.7 quality points

D Poor = 1.0 = quality points

F Failure = 0 quality points

AU Audit

M Missing grade

I Incomplete

W Withdrawal

S Satisfactory

U Unsatisfactory

P Pass

**A grade of 2.0 or better is required to earn credit for graduate-level classes.*

*M - Missing*

This indicates that the grade was not available from the instructor at the time the transcript was printed. The "M" grade is ignored in credit and grade computations.

*S - Satisfactory*

The "S" grade is given only in non-credit courses.

*U - Unsatisfactory*

The "U" grade is given only in non-credit courses.

For complete descriptions of the other special grades, please refer to the *Standards of Progress - Grading System*.

*Grade Reports*

Reports of the final grade in each subject will be made available to the student soon after the close of each semester. However, grade reports are withheld from students who have delinquent accounts with the Administration Office, Security, or Library.

**Satisfactory Progress**

*Minimum GPA Requirements*

Graduate students are required to maintain a cumulative GPA of 3.0 or better. If a student's cumulative GPA falls below 3.0, then he or she will be placed on academic probation. Probationary students must earn a 3.0 GPA in their graduate-level classes in subsequent semesters, until the cumulative GPA is 3.0 or better. Students who fail to attain a 3.0 in graduate-level classes during a probationary semester will be academically terminated. Terminated students may apply for re-admission after a 12-month suspension.

*Failing to Complete Program within the Maximum Time Frame*

Students who fail to complete their program within 55 attempted credits will be placed on academic probation. Probationary students will work with their graduate advisor to develop a completion plan that outlines the quickest path to completion. Failure to meet the terms of this plan will result in academic termination.

**Transfer Credits**

Graduate students are eligible to transfer up to six credits from other colleges and other DigiPen programs. Please refer to the section on waiver credit for complete guidelines on DigiPen's transfer policy.

**M.S. in C.S. Program Curriculum**

Listed below are all of the graduate-level courses currently offered at DigiPen Institute of Technology. Courses designated with an "R" are required courses, and courses designated with an "E" are electives. Courses with both notations may be used as a required course or as an elective.

| Course | Course Title | Credits | R/E |
|---|---|---|---|
| CS 500 | Ray Tracing | 3 | E |
| CS 525 | Object-Oriented Design and Programming | 3 | R |
| CS 529 | Fundamentals of Game Development | 3 | R |
| CS 530 | Advanced Game Engine Design | 3 | E |
| CS 541 | Advanced Computer Graphics | 3 | R |
| CS 560 | Advanced Animation and Modeling I | 3 | R/E |
| CS 561 | Advanced Animation and Modeling II | 3 | E |
| CS 562 | Advanced Real-Time Rendering Techniques | 3 | R/E |
| CS 570 | Computer Imaging | 3 | E |
| CS 580 | Artificial Intelligence in Games | 3 | E |
| CS 581 | Introduction to Artificial Intelligence | 3 | R/E |
| CS 582 | Reasoning under Uncertainty | 3 | R/E |
| CS 590 | Introduction to Computation Theory | 3 | E |
| CS 598 | Computer Science Seminar | 1 | R |
| CS 599 | Special Topics in Computer Science | 3 | E |
| CS 601 | Master's Thesis I | 3 | R/E |
| CS 602 | Master's Thesis II | 3 | R/E |
| MCM 600 | Master's Continuous Matriculation | 1 | E |
| GAM 541 | Master's Game Project I | 3 | R |
| GAM 550 | Master's Game Project II | 3 | R |
| GAM 551 | Master's Game Project III | 3 | R |
| MAT 500 | Curves and Surfaces | 3 | E |
| MAT 550 | Advanced Curves and Surfaces | 3 | E |
| MAT 551 | Quaternions, Interpolations, and Animation | 3 | E |
| MAT 552 | Wavelets | 3 | E |
| MAT 553 | Differential Geometry | 3 | E |
| MAT 554 | Discrete and Computational Geometry | 3 | E |
| MAT 555 | Graph Theory | 3 | E |
| MAT 556 | Advanced Differential Equations | 3 | E |
| MAT 557 | Numerical Analysis | 3 | E |
| MAT 559 | Computational Algebraic Geometry | 3 | E |
| MAT 561 | Introduction to Number Theory and Cryptography | 3 | E |
| MAT 562 | Fuzzy Sets and Logic | 3 | E |
| MAT 599 | Special Topics in Mathematics | 3 | E |
| PHY 500 | Advanced Physically-Based Modeling | 3 | E |
| PHY 550 | Physics Simulation | 3 | E |

**Recommended Course Sequence Chart (M.S.C.S.)**

| Semester | Course | Course Title | R/E | Credits |
|---|---|---|---|---|
| **Semester 1** | CS 525 | Object-Oriented Design and Programming | R | 3 |
| | CS 529 | Fundamentals of Game Design | R | 3 |
| | Elective | CS, MAT, or PHY elective*** | E | 3 |
| | | **Semester Total** | | **9** |
| **Semester 2** | GAM 541 | Master's Game Project I | R | 3 |
| | CS 541 | Advanced Computer Graphics | R | 3 |
| | Elective | CS, MAT, or PHY elective*** | E | 3 |
| | | **Semester Total** | | **9** |
| **Semester 3** | CS 560 or CS 581 | Advanced Animation and Modeling I or Introduction to Artificial Intelligence | R | 3 |
| | GAM 550 | Master's Game Project II | R | 3 |
| | CS 601 or Elective | Master's Thesis I or CS, MAT, or PHY elective*** | R/E | 3 |
| | | **Semester Total** | | **9** |
| **Semester 4** | CS 562 or CS 582 | Advanced Real-Time Rendering Techniques or Reasoning under Uncertainty | R | 3 |
| | GAM 551 | Master's Game Project III | R | 3 |
| | CS 602 or Elective | Master's Thesis II or CS, MAT, or PHY elective*** | R/E | 3 |
| | | **Semester Total** | | **9** |
| | CS 598 | Computer Science Seminar | R | 1* |
| | | **Degree Total** | | **37**** |

Please note the following:

*** At least one math elective must be selected.

** Required courses can be waived on a case-by-case basis, but the total number of credits must be greater than or equal to 37.

* CS 598 - Computer Science Seminar (1 credit) is required and can be taken during any semester.

# COURSE DESCRIPTIONS FOR THE ACADEMIC YEAR

# 2010-2011

# Course Descriptions Table of Contents

*Listed below are the page numbers for the following departments and course titles.*

# Department of Computer Science

## COMPUTER SCIENCE

### CS 100 Computer Environment I (3 Cr.)

*Prerequisite(s): None*

*Concurrent Course(s): CS 100L*

This course provides students with a solid understanding of the fundamental elements on which computers are based. Topics covered include number systems, operations in and conversions between number systems, representation of numbers in computation, basic electricity, electric circuits, digital systems, logic circuits, Boolean algebra, data representations, digital memory, microcontrollers, embedded systems, and an overview of operating systems. The theoretical lectures are followed up by labs, during which students will work together in small teams to build and test autonomous robotic car projects. This understanding of hardware will enable students to expand the limits of their future games with unique interface devices, while the practical experience of low-level programming will provide students with the skills essential for code optimization. This class meets weekly for three hours of lecture and two additional hours of supervised labs.

### CS 100L Computer Environment Lab (1 Cr.)

*Prerequisite(s): None*

*Concurrent Course(s): CS 100*

CS 100L is the lab component of the introductory Computer Environment course. Students will meet weekly to explore the topics presented in CS 100, from building basic analog and digital circuits to programming a microcontroller to managing autonomous robot navigation.

### CS 101 Introduction to Computer Environment (1 Cr.)

*Prerequisite(s): None*

This course provides students with an introductory overview of the fundamental elements on which computers are based. Topics covered by the curriculum include basic computer hardware systems, operations, and structures. An introduction to basic programming logic is also included. This knowledge will provide students with a well-rounded overview of how computers operate.

### CS 105 Computer Environment II (3 Cr.)

*Prerequisite(s): CS 100 & CS 120*

CS 105 students learn the function and implementation of digital memory, microprocessors, microcontrollers, and embedded systems. Students work together in small teams to design, build, and test autonomous robotic car projects. This practical exercise builds upon the theoretical lectures on electronics, low-level programming, and algorithm design. This understanding of hardware enables students to expand the limits of their future games with unique interface devices, while the practical experience of low-level programming provides the students with skills essential for code optimization.

### CS 115 Introduction to Scripting and Programming (3 Cr.)

*Prerequisite(s): CG 350*

This class introduces programming environments to students who are not experienced programmers. This course will cover simple logic, programming flow, and the use of variables. It will introduce students to the history of programming and the basic vocabulary of the programming industry. The course culminates in a series of hands-on exercises using this knowledge to solve problems. At his or her discretion, the instructor may cover special topics in programming or scripting. Credit may be received for CS 115 or for CS 120, but not for both.

### CS 120 High-Level Programming I - The C Programming Language (3 Cr.)

*Prerequisite(s): None*

*Concurrent Course(s): CS 120L*

In presenting the C programming language, this course serves as a foundation for all high level programming courses and projects. It provides the fundamentals in programming, including control flows (such as statement grouping, decision making, case selection, procedure iteration, and termination test) and basic data types (such as arrays, structures, and pointers). Additionally, it will discuss intensively the lexical convention, syntax notation, and semantics.

### CS 120L High-Level Programming I Lab (1 Cr.)

*Prerequisite(s): None*

*Concurrent Course(s): CS 120*

CS 120L is the lab component of the introductory High-Level Programming I course. Students will meet for two hours weekly to apply the concepts presented in CS 120 in a controlled environment.

### CS 170 High-Level Programming II - The C++ Programming Language (3 Cr.)

*Prerequisite(s): CS 120*

*Concurrent Course(s): CS 170L*

This course is a continuation of High Level Programming I (CS 120). It introduces the C++ language with particular emphasis on its object-oriented features. Topics covered include stylistic and usage differences between C and C++, namespaces, function and operator overloading, classes, inheritance, class and function templates, STL lists, and vectors. Concurrent enrollment in CS 170L is required.

### CS 170L High-Level Programming II Lab (1 Cr.)

*Prerequisite(s): None*

*Concurrent Course(s): CS 170*

CS 170L is the lab component of the High-Level Programming II course. Students will meet weekly to work on topics presented in the CS 170 lectures in a lab environment.

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

*Prerequisite(s): CS 100 & CS 120*

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, we cover the following: 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 200 Computer Graphics I (3 Cr.)**

*Prerequisite(s): CS 170 & MAT 140*

CS 200 presents fundamental mathematical elements, data structures, and algorithms useful for animating and viewing two dimensional primitives. The course aims to fulfill two objectives. The first objective is to provide students with a sufficient mathematical and algorithmic background to design and implement 2D graphics applications. The second objective is to prepare students with the knowledge required for writing three dimensional graphics applications. The first half of the course deals with scan-conversion algorithms for rasterizing 2D primitives such as lines, circles, ellipses, triangles, and arbitrary polygons. The second half of the course is concerned with the viewing and animation of these 2D primitives. The course covers topics such as interpolation techniques, transformations, culling, clipping, animation techniques, and the 2D viewing pipeline.

**CS 220 Advanced C (3 Cr.)**

*Prerequisite(s): CS 170*

This course focuses on advanced topics of the C programming language. Such topics include advanced pointer manipulation techniques, pointer applications, and using standard library functions more efficiently. The course also presents students with many methods designed to avoid common C programming errors and pitfalls. Mastering the various topics presented in this course will enable students to become more productive programmers.

**CS 225 Advanced C/C++ (3 Cr.)**

*Prerequisite(s): CS 170*

This course builds on the foundation created in the first two high-level programming courses (CS 120/170). It presents advanced topics of the C/C++ programming language in greater detail. Such topics include advanced pointer manipulation, utilizing multi-dimensional arrays, complex declarations, and standard library functions. Advanced C++ topics include class and function templates, operator overloading, multiple inheritance, runtime type information, the standard template library, and performance issues.

**CS 230 Game Implementation Techniques (3 Cr.)**

*Prerequisite(s): CS 120*

*Concurrent Course(s): CS 170*

CS 230 presents game implementation techniques and engine architecture. Students will investigate foundational concepts of game architecture, such as game-system component separation and game flow, while learning about essential elements such as the game state manager, input/output handler, and frame rate controller. CS 230 introduces Windows programming, state machines, and collision detection algorithms, which students will integrate into their own remakes of classic games. As part of their implementation, students will create and expand their own collision, vector, and matrix libraries, enabling them to incorporate basic physics engines. Students will survey concepts in space partitioning, particle systems, map editors, and other elements as a bridge to more advanced concepts in implementation techniques and engine architecture.

**CS 241 Fundamental Computer Graphics (3 Cr.)**

*Prerequisite(s): MAT 140, & MAT 200 or MAT 230*

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 245 Introduction to Interactive Sound Synthesis (3 Cr.)**

*Prerequisite(s): CS 170, CS 180, MAT 140, & PHY 200*

This course explores dynamic sound synthesis, 3D-directional auditory effects, and sonic ambience to real-time simulation and video games. The subjects include mixing audio and modulating dry recorded sounds using wave table synthesis. Students will learn how to create collision sounds using additive synthesis, wind effects using subtractive synthesis, natural sounds using granular synthesis and physical modeling, ambiences using layering and spectral filtering, 3D spatialized surround sound panning, inter-aural time difference, inter-aural intensity difference, and Head Related Transforms (HRTFS). Students will also study algorithms and techniques for real-time multi-threaded programming and synthesized sound integration for the game engine.

**CS 250 Computer Graphics II (3 Cr.)**

*Prerequisite(s): CS 200*

CS 250 examines the mathematical elements and algorithms used in the design and development of real-time three dimensional computer graphics applications such as games, cockpit simulators, and architectural walk-throughs. 3D computer graphics involve drawing pictures of 3D objects, usually on a 2D screen. This process of generating a 2D image of a 3D graphics application can be described as a series of distinct operations performed on a set of input data. Each operation generates results for the successive one. This process is called the graphics rendering pipeline, and it is the core of real-time computer graphics. The graphics pipeline can be conceptualized as consisting of three stages: application, transformation, and rasterization. The course begins by introducing the 3D graphics pipeline. The application stage is examined from the viewpoint of the representation, modeling, and animation of 3D objects. Topics considered include user interaction, camera animation techniques, simulation of dynamic objects, and collision detection techniques. Next, the course examines the process of mapping 3D graphic objects from model-space to viewport coordinates. The transformation stage implements this process. Finally, the conversion of a geometric primitive in viewport coordinates into a 2D image is studied. The rasterization stage implements this final process.

**CS 251 Introduction to Computer Graphics (3 Cr.)**

*Prerequisite(s): CS 170*

This course provides a high-level overview of three-dimensional computer graphics. It is intended for game designers and artists to enable them to understand the fundamental components of graphics engine and their applications in real-time simulation and video game software. Course topics include graphics pipeline architecture, 3D transformation operations, viewing and projection, lighting and shading models, surface detail techniques, shadow algorithms, hidden object culling and removal techniques, 3D object modeling, and animation and physically-based motion control. The popular graphics programming languages (GDI plus, OpenGL, DirectX) and shader programming are also discussed in the course.

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

*Prerequisite(s): CS 170*

This course introduces the hierarchical network communication in a distributed computing environment. Course topics cover network technologies, architecture, and protocols. The curriculum will give 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.

**CS 261 Computer Networks II (3 Cr.)**

*Prerequisite(s): CS 260*

This class extends the TCP/IP protocols studied in CS 260 to wireless devices. This course goes further in depth into some topics covered in the introductory networks course as well as additional subjects of interest. Topics include TCP/IP related protocols such as NAT, WAP, and DNS; physical media access such as aloha, OFDM, and WIDEBAND; wireless standards and protocols; and network security. The curriculum will cover additional topics based on the state of the industry.

**CS 270 Advanced C++, Designing Classes (3 Cr.)**

*Prerequisite(s): CS 220*

This course presents the object-oriented methodologies used in the development of large software projects. Combined with the knowledge acquired in the C++ programming language courses (CS 120/170/220), students will be able to better manage their game software design and production and produce reusable code and libraries. Among the advanced C++ topics are class and function templates, function and operator overloading, multiple inheritance, runtime type information, the standard template library, and performance issues.

**CS 275 Scripting Languages (3 Cr.)**

*Prerequisite(s): CS 115 or CS 120*

This course covers the concepts and implementation strategies for using high-level scripting languages in game development. Students will focus on object-oriented programming, high-level English-like structure, speed of development, and ease of use. The course includes a survey of commercial languages, as well as proprietary scripting languages from industry applications. Students will examine the process of conceptualizing a syntax for a game-based scripting language and examine how such a language is compiled and interpreted by a game engine. Using the syntax they have created, they will create a number of scripts that could be used in a game. Additionally, the class will cover such relevant topics as data-driven technology, modular coding, function calls, and procedures.

**CS 280 Data Structures (3 Cr.)**

*Prerequisite(s): CS 220 or CS 225*

This course introduces the classical abstract data types (ADT) in computer science. ADTs provide the hierarchical views of data organization used in programming. Among the topics covered are the algorithms and primitives of the data structures for arrays, linked lists, stacks, queues, trees, hash tables, and graphs. In addition, the course provides an introduction to algorithm complexity and notation.

**CS 300 Advanced Computer Graphics I (3 Cr.)**

*Prerequisite(s): CS 250*

This course introduces students to algorithms that are essential to creating photorealistic images in interactive simulations. Topics covered include an overview of modern GPU (graphics processor unit) architecture and the common graphics APIs used, including OpenGL and DirectX. Rendering techniques covered include texturing, illumination models, transparency, shading algorithms, mapping techniques (bump mapping, environment/reflection mapping, etc.), and shadows. Students will learn how to implement all algorithms by using vertex and pixel shaders.

**CS 311 Introduction to Databases (3 Cr.)**

*Prerequisite(s): CS 170*

This course provides students with a broad overview of database systems. It presents the fundamentals, practices, and applications of computer databases. Topics include database architectures, data modeling, design schemes, relational algebra, query languages, transaction processing, and database implementation. Students will explore massively multiplayer online games (MMOG) to examine a case study of database design and implementation.

**CS 315 Low-Level Programming (3 Cr.)**

*Prerequisite(s): CS 100, CS 100L, CS 120, CS 120L, & CS 180*

This course introduces students to microprocessor architecture as well as the knowledge required to directly address and program the microprocessor and the various hardware devices connected to it. Since the resulting code is usually faster than similar code written in a high-level language such as C or C++, low-level programming has great importance in improving the response speed of real-time interactive programs. In this course, students program a microprocessor used to control a hand-held gaming device. The processor used is typically an 8-bit machine, which is easier to understand than 32 or 64-bit machines, but uses the same principles. Topics include registers, instruction set, addressing modes, the stack, I/O ports, interrupts, graphics, animation, collision detection, scrolling, and windowing. There is also a brief introduction to the instruction sets used on larger machines.

**CS 330 Algorithm Analysis (3 Cr.)**

*Prerequisite(s): CS 225 or CS 270, CS 280, & MAT 200 or MAT 230*

This course provides students with an introduction to the analysis of algorithms, specifically proving their correctness and making a statement about their efficiency. Topics for discussion may include loop invariants, strong mathematical induction and recursion, asymptotic notation, recurrence relations, and generating functions. Students will examine examples of algorithm analysis from searching and sorting algorithms.

**CS 350 Advanced Computer Graphics II (3 Cr.)**

*Prerequisite(s): CS 300*

This course deals with the efficient representation and processing of complex 3D scenes in order to avoid bottlenecks in the use of the CPU and the GPU. Specific topics include a variety of spatial data structures (binary space-partitioning trees, octrees, kd-trees, and grid data structures), several object-culling methods (occlusion, viewport, and portal), and finally the construction and uses of bounding volumes and their hierarchies for collision detection and related geometric operations.

**CS 365 Software Engineering (3 Cr.)**

*Prerequisite(s): CS 225 or CS 270*

This course covers a wide range of topics in software engineering from the practical standpoint. It encompasses project management issues as well as technical development principles and methods. Topics include system architecture, security, methodologies and notation, UML, object oriented analysis and design, requirements analysis, implementation, verification, validation, maintenance, and software engineering standards. Risk management and iterative design receive special emphasis. Student teams will apply acquired knowledge to a substantial project.

**CS 370 Computer Imaging (3 Cr.)**

*Prerequisite(s): CS 280*

The course will be taught at the upper division/ graduate level and will bring image analysis and image processing into a unified framework that provides a useful paradigm for both computer vision and image processing applications. Course material covers methods students can apply in creating special effects with digital images and preparing graphics information for either human or computer interpretation. Course content covers both image processing, which transforms an image, and computer vision, which extracts a measurement or description.

**CS 380 Artificial Intelligence for Games (3 Cr.)**

*Prerequisite(s): CS 225*

This course will introduce students to a wide range of concepts and practical algorithms that are commonly used to solve game AI problems. Case studies from real games will be used to illustrate the concepts. Students will have a chance to work with and implement core game AI algorithms. Topics covered will include the game AI programmer mindset, AI architecture (state machines, rule-based systems, goal-based systems, trigger systems, smart terrain, scripting, message passing, and debugging AI), movement, pathfinding, emergent behavior, agent awareness, agent cooperation, terrain analysis, planning, and learning/adaptation.

**CS 381 Machine Learning (3 Cr.)**

*Prerequisite(s): CS 280*

This course deals with constructing computer programs that automatically improve with experience. Observed events are used to inductively construct decision trees, which can be used by computer-controlled game characters to change behaviors. Students will explore concept learning, partial ordering, reinforcement learning, conditional probability, Bayesian learning, the evaluation of hypotheses and instance-based learning. Types of neural networks examined include perceptrons, backpropagation, radial basis functions, and adaptive resonance theory. We demonstrate the effectiveness of genetic algorithms and show the power of a neuro-genetic approach. The class concludes by looking at inductive analytical learning.

**CS 399 Special Topics in Computer Science (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

**CS 420 Graphics File Format and Data Compression Techniques (3 Cr.)**

*Prerequisite(s): CS 250 & CS 280*

This course covers data compression techniques for still images and multimedia. Students will learn the theory behind data compression and how it is used in specific formats. Methods covered include run-length encoding, Huffman coding, dictionary compression, transforms, and wavelet methods. Students will learn these techniques by examining various popular graphic file formats, such as BMP, JPEG, DXTn, and MPEG.

**CS 460 Advanced Animation and Modeling I (3 Cr.)**

*Prerequisite(s): CS 300, GAT 300, & MAT 300*

3D animation and modeling play significant roles in computer simulation and video game software. Game developers need to have a comprehensive understanding of these techniques. This course introduces algorithms for specifying and generating motion for graphical objects. It addresses practical issues, surveys accessible techniques, and provides straightforward implementations for controlling 3D moving entities with different characteristics. The class covers two broad categories. Students will first learn an interpolation-based technique, which allows programmers to fill in the details of the motion or shape once the animator specifies certain basic information, such as key frames, paths, coordinate grids, or destination geometry. Then they will learn a behavior-based technique, which generates motion that satisfies a set of rules, such as kinematics, physics, or other constraints.

**CS 500 Ray Tracing (3 Cr.)**

*Prerequisite(s): Entrance into the Master of Science in Computer Science program*

In this class, students will be introduced to the basic techniques used in ray tracing, including intersections calculations, illumination models, and anti-aliasing. The underlying physical and mathematical underpinnings will also be discussed, as well as the practical aspects of how to implement a ray tracer.

**CS 525 Object-Oriented Design and Programming (3 Cr.)**

*Prerequisite(s): None*

This course focuses on object-oriented design and programming using the C++ programming language. It is targeted at the graduate student that is already fluent in one or more programming languages. Among the language-specific topics included are pointers, pointer arithmetic, dynamic memory management, namespaces, scope, operator overloading, generic programming (templates), the Standard Template Library, and standard compliance. Object-oriented topics will cover analysis and design considerations. Students considering this course need to have programming fluency in another imperative language, preferably with some basic knowledge of C++. After successfully completing this course, students should have a much deeper understanding of the subtleties and complexities of using object-oriented facilities of the C++ programming language, the standard programming language used in the game industry today.

**CS 529 Fundamentals of Game Development (3 Cr.)**

*Prerequisite(s): B.S. in Computer Science or related field of study or Permission of instructor*

This course presents techniques in real-time interactive simulation and video game implementations. It introduces the 2D and 3D game engine architecture, including game and system components separation, game flow, game state manager, handling input/output, and the frame rate controller. The class introduces students to the game development environment, such as Windows programming SDK and graphics library DirectX API. It also covers commonly practiced techniques such as space partitioning, AI techniques, particle systems, and collision algorithms. Several physics techniques will be discussed and implemented (such as jump and reflection) in addition to behavior algorithms (such as state machines). Different game genres will be explained, including Asteroids (2D), Platform (2D), Brix (2D), and Pong (3D). Students will learn how to implement and expend collision, matrix, and vector libraries, according to the specific requirements for different games.

**CS 530 Advanced Game Engine Design (3 Cr.)**

*Prerequisite(s): CS 529 & CS 541*

A game engine is a complex framework or library that provides vital functionalities to any video game independent of the game content or genre. A well-designed game engine must at least provide the following functionalities: data management, rendering, networking, dynamics, input controllers, audio, editing tools, modeling tools, and a high-level application programming interface (API) for the entire framework that hides the low-level details of graphics, networking, and audio programming. Thus, a game engine is a complex library consisting of various components that must all be efficiently integrated into a single framework using the principles of object-oriented design. In this course, students will study the computer graphics, mathematics, data structures, and algorithms required to design and architect a game engine that can handle complex graphics applications that handle three-dimensional data such as games and computer-aided design.

**CS 541 Advanced Computer Graphics (3 Cr.)**

*Prerequisite(s): CS 241 & MAT 250*

In this course, students will study algorithms and techniques that are designed to improve efficiency and increase the realism of 3D graphics. Two main subjects will be discussed: techniques that add details on object surfaces, including lighting and shading models, texture mapping, bump mapping, environmental mapping and shadow algorithms; and algorithms that eliminate invisible polygons/objects from being further processed by the graphics pipeline, including BSPTree, occlusion, portal, and others.

**CS 560 Advanced Animation Algorithms I (3 Cr.)**

*Prerequisite(s): CS 529, CS 541, & MAT 500*

3D animation and modeling play significant roles in computer simulation and video game software. Game developers need to have a comprehensive understanding of these techniques. This course introduces algorithms for specifying and generating motion for graphical objects. It addresses practical issues, surveys accessible techniques, and provides straightforward implementations for controlling 3D moving entities with different characteristics. The class covers two broad categories. Students will first learn an interpolation-based technique, which allows programmers to fill in the details of the motion or shape once the animator specifies certain basic information, such as key frames, paths, coordinate grids, or destination geometry. Then they will learn a behavior-based technique, which generates motion that satisfies a set of rules, such as kinematics, physics, or other constraints.

**CS 561 Advanced Animation and Modeling II (3 Cr.)**

*Prerequisite(s): CS 460 or CS 560*

This course is the continuation of CS 460/560. It introduces students to advanced animation and modeling algorithms and techniques in some special areas to increase the physical realism of dynamic objects in 3D graphical environments. The topics include group object (particles, fish, and birds) control, natural phenomena (water, snow, soil, smoke, and fire) simulation, plant (trees and grass) modeling, facial animation (expression and speech synchronization), and deformable object modeling.

**CS 562 Advanced Real-Time Rendering Techniques (3 Cr.)**

*Prerequisite(s): CS 300 or CS 541*

This course introduces students to data structures, algorithms, and techniques concerned with rendering images more accurately and efficiently in interactive computer simulations and video game software. Topics will include patch and surface algorithms, terrain rendering techniques, anti-aliasing theory and practice, advance lighting techniques, hard and soft shadow map methods, multi-pass rendering techniques, high-dynamic range (HDR) rendering, advanced shading and mapping, and real-time vertex/pixel shader programming essentials. Additionally, students will practice these subjects by working with the supporting OpenGL or DirectX libraries.

**CS 570 Computer Imaging (3 Cr.)**

*Prerequisite(s): Senior or graduate-level standing in Computer Science*

The course introduces students to computer imaging where image analysis and image processing are unified to provide a useful paradigm for both computer vision and image processing applications. Students will use C# to implement different algorithms introduced in the course. Upon completion of this course, students are expected to have gained a general understanding of the fundamentals of digital image processing and computer vision. They will also have achieved a familiarity with the current analytical tools that are used in computer imaging applications and the ability to design and develop basic algorithms to solve computer-imaging problems.

**CS 580 Artificial Intelligence in Games (3 Cr.)**

*Prerequisite(s): CS 280*

This course introduces students to a wide range of concepts and practical algorithms that are commonly used to solve video game AI problems. Case studies from real games will be used to illustrate the concepts. Students will have a chance to work with and implement core game AI algorithms. Topics covered include the game AI programmer mindset, AI architecture (state machines, rule-based systems, goal-based systems, trigger systems, smart terrain, scripting, message passing, and debugging AI), movement, pathfinding, emergent behavior, agent awareness, agent cooperation, terrain analysis, planning, and learning/adaptation.

**CS 581 Introduction to Artificial Intelligence (3 Cr.)**

*Prerequisite(s): CS 280*

This course covers important AI areas, including search algorithms, knowledge representation, production systems, game playing, uncertainty handling, learning, and planning. Students are required to have basic knowledge of data structures, probability theory, and mathematical logic. Upon successful completion of this course, students will have gained an understanding of and skills relevant to modern AI techniques, practices, and design solutions.

**CS 582 Reasoning under Uncertainty (3 Cr.)**

*Prerequisite(s): CS 580 & CS 581*

This course covers important AI topics, including hidden Markov models and advanced search algorithms (D-lite and cooperative path finding). Students will also examine uncertainty handling (Dempster-Shafer theory), learning (kernel machines), and advanced topics in planning (conditional and adversarial planning).

**CS 590 Computational Complexity (3 Cr.)**

*Prerequisite(s): CS 280, CS 330, or Equivalent*

The study of computational complexity is at the core of theoretical computer science. The key issue to understand in complexity theory is the nature of efficient computation. Hence, it is a natural extension of computability theory, which studies the nature of computation without regard for resource bounds. This course addresses questions such as: What is an algorithm? What problems can or cannot be solved by an algorithm? What problems can or cannot be solved efficiently by an algorithm? How can we classify and compare problems according to their intrinsic computational complexity? Exploring this last question will constitute the bulk of the course. Students will be introduced to ways to compare computational problems, even when we do not know how to solve them efficiently. They will also study the complexity classes (e.g. P, NP, PSPACE, L, NL, BPP, etc.) into which they fall. As the course progresses, students will be led to examine more questions, such as: Is it easier (more efficient) to comply seek approximate solutions? Can flipping coins help in designing efficient algorithms? Can biology and/or physics lend a hand?

**CS 598 Computer Science Seminar (1 Cr.)**

*Prerequisite(s): Upon approval of academic advisor*

Every semester, guest speakers, faculty members, and/or graduate students offer to DigiPen students a number of presentations that cover different research topics in computer science. Each speaker decides on the choice of topic, but they usually are within the general boundaries of students' courses of study. This seminar aims not to pursue any particular topic but rather to explore new research in more depth to allow students to develop their own skills in theoretical analysis. Each speaker's paper(s) will be available to students. They will be required to read these papers and to choose one to expand upon for a final paper and an oral presentation.

**CS 599 Special Topics in Computer Science (3 Cr.)**

*Prerequisite(s): Upon approval of academic advisor*

This course is an upper- level graduate class. It is offered infrequently to explore various subjects that may be topical or of special interest. Subjects might include (but are not limited to) 3D graphics rendering algorithms, advanced animation and modeling techniques, artificial intelligence, numerical solutions, and the applications of mathematics and physics in real-time interactive simulations and video game software.

**CS 601 Master's Thesis I (3 Cr.)**

*Prerequisite(s): Upon approval of academic advisor*

This course is the first part of the master's program thesis. The student shall work with the thesis advisory committee to select a research topic, to conduct a complete survey of existing techniques and algorithms in the related field, to identify fundamental knowledge, and to collect materials and tools that are essential to his or her research work. Upon completion of the course, the student shall produce a written document to summarize the above steps. In this document, the student is also encouraged to include an original idea of proposed approaches to the problem.

**CS 602 Master's Thesis II (3 Cr.)**

*Prerequisite(s): Approval of thesis advisory committee and CS 601*

This course is the second part of the master's program thesis. Students shall continue to work under the supervision of the thesis advisory committee to create the theory of the proposed research topic, to develop algorithms, and to possibly create a prototype to verify the theory and methods. Upon completion of the class, the student must submit his or her formal written thesis to the advisory committee to summarize the entire research and pass the oral exam to defend the thesis.

**MCM 600 Master's Continuous Matriculation (1 Cr.)**

*Prerequisite(s): None*

Maintaining continuous registration is a requirement for the M.S.C.S. degree. Students who have completed most course requirements but are finishing their thesis or are satisfying incomplete grades must register to maintain continuous matriculation. This course may be taken up to two semesters, at which time it is expected that all program requirements will have been met. This credit may not be applied toward degree-completion requirements.

# Department of Electrical and Computer Engineering

## ELECTRICAL AND COMPUTER ENGINEERING

**ECE 200 Electric Circuits (3 Cr.)**

*Prerequisite(s): CS 100 & CS 100L*

Usually taken after ECE 210, this course is more theoretical than digital electronics. It emphasizes the basic principles on which digital electronics are based. Exploring these principles leads one to conclude that all electronics are really analog. Effects seen in digital circuits may be due to unanticipated capacitance or inductance. It is important to understand how these transient phenomena arise. It is also often useful to have an analog section in a primarily digital circuit. Topics in this course include passive components, series and parallel circuits, two-terminal networks, two-port networks, circuit reduction techniques, impedance analysis, measurement of waveforms, power, and filters. It also looks at operational amplifiers, step responses of various simple circuits, and the Laplace transform.

**ECE 210 Digital Electronics I (4 Cr.)**

*Prerequisite(s): CS 100 & CS 100L*

The objective of this class and the following ECE 260 is to prepare students well enough at hardware design and troubleshooting so that he or she can determine whether a problem comes from hardware or software. The class uses TTL family integrated circuits to build digital devices. Part of the time is spent in the lab. Topics in this course include digital logic, programmable logic devices, FPGA, arithmetic circuits, multiplexers and demultiplexers, logic families, memory devices, and flip-flops.

**ECE 220L Introduction to Robotics (3 Cr.)**

*Prerequisite(s): CS 100, CS 100L, & GAM 150*

Continuing the concepts learned in CS 100 and CS 100L, students will design and build a device that uses an embedded microprocessor. This device usually takes the form of a robot or electronic toy. The device must be interactive with either humans or the environment, and it must successfully demonstrate digital communication. Throughout the semester, students will document the design, production, and service of their device. This course introduces concepts of software engineering and process documentation, and it will emphasize system-level design so that students can build an initial prototype and then revise key components to be cost-competitive.

**ECE 260 Digital Electronics II (4 Cr.)**

*Prerequisite(s): ECE 210*

In this course, students will enhance their abilities with digital logic and learn about the trade-offs in putting functionality in circuits or programming them. Students learn how to use the power of a logic analyzer to track down system anomalies. Topics include counter circuits, shift registers, timers, digital/analog conversion, microprocessor architecture, ports, and interrupt handling. This course also examines the use of logic analyzers and in-circuit emulation (ICE) with particular emphasis on small-scale systems for embedded devices. Lab time will enhance concepts covered in the lectures.

**ECE 270L Real-Time Operating Systems (4 Cr.)**

*Prerequisite(s): CS 180 & ECE 210*

Students will learn the theory behind modern, real-time operating systems (RTOS). ECE 270L covers multi-tasking, interrupt handling, threading, synchronization, preemption, resources, and messaging, while dealing with fault tolerance and reliability. Students will apply this knowledge by creating their own RTOS for an embedded microprocessor system.

**ECE 300 Embedded Microcontroller Systems (3 Cr.)**

*Prerequisite(s): CS 315 & ECE 260*

*Concurrent Course(s): ECE 310L*

This class covers the remaining concepts needed to build the hardware and software for a hand-held gaming device. By this point, students will have studied many pieces needed in electronic systems and have worked with microprocessors. This class aims to bring together additional concepts and expand the understanding of a microprocessor or microcontroller system. Topics include Harvard architecture, microprocessor systems, analog/digital conversions, timing control, serial ports, peripheral access, and digital signal processor (DSP) applications to real-time audio processing. Students will emerge with a better understanding of system architecture and how the key components interact.

**ECE 310L C.E. Project III: Gaming System (5 Cr.)**

*Prerequisite(s): CS 315, ECE 220L, ECE 260, & ECE 270L*

*Concurrent Course(s): ECE 300*

In this course, students will work in small teams to design, to build, to program, and to test a small gaming device. Students will integrate a microprocessor with storage, input, and display devices into a hand-held game platform. This project makes use of microprocessor and operating system concepts studied earlier. Students will also be shown effective techniques in collaborative engineering environments.

**ECE 350 Control Systems (3 Cr.)**

*Prerequisite(s): MAT 256*

This course will present mathematical methods of describing systems, with an emphasis on electromechanical systems. Topics covered include signals and systems, state-space description, convolution, frequency analysis of signals, feedback, Bode and Nyquist root locus analyses, stability, phase margin, observability, tracking errors, motor control, PID control, Kalman filters, Laplace transforms, and Fourier transforms.

**ECE 360L C.E. Project IV: Gaming System (5 Cr.)**

*Prerequisite(s): ECE 300 & ECE 310L*

In this course, students will work in small teams to finish their gaming device that they started in ECE 310L. Students will design and create low-level software to communicate and to provide a framework for games on the team gaming device. Students will showcase their final project with a small game.

**ECE 390/490 C.E. Internship I/ II (5 Cr.)**

*Prerequisite(s): ECE 270L & ECE 310L*

The ECE internship is a monitored work or service experience in an ECE-related professional environment. The student intern, faculty advisor, and internship provider will agree on intentional learning goals and a method of evaluation. Due to the professional nature of the work, there is a high degree of responsibility associated with this course. Internships are structured along the Internship Guidelines available from the Administration Office.

**ECE 399 Special Topics in Electrical and Computer Engineering (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

**ECE 400 Motors and Sensors (3 Cr.)**

*Prerequisite(s): PHY 270*

An electronic system is useless unless it interacts with the outside world. Students have used sensors and actuators before, but in this course, they will examine them in more detail. They will develop their understanding of the capabilities and limitations of some popular sensors. Additionally, they will study the physical principles behind an electrical motor/generator. Topics in this course include three-phase circuits, transformers, power transmission, motors and generators, stepper motors and encoders, motor controllers, limit switches, and sensors (optical, acoustic, eddy current, and triangulation).

**ECE 410L C.E. Senior Project I (5 Cr.)**

*Prerequisite(s): ECE 350 & ECE 360L*

*Concurrent Course(s): ART 410 & ECE 400*

In this course, students will work in small teams under the supervision of a professor to design and to implement a senior-level C.E. project.

**ECE 420 Digital Signal Processing (3 Cr.)**

*Prerequisite(s): ECE 350 & MAT 256*

In this course, students will be presented with discrete signal processing techniques, starting from understanding signals in the time domain. They will then learn the theory and application of signal transformation into frequency and Z-domains. Lectures will be reinforced with DSP implementation.

**ECE 460L C.E. Senior Project II (5 Cr.)**

*Prerequisite(s): ECE 410L*

In this course, students will work in small teams under the supervision of a professor to complete their senior-level C.E. project.

# Department of Fine Arts and Animation

## ANIMATION

**ANI 101 Introduction to Animation - Theories and Techniques I (3 Cr.)**

*Prerequisite(s): None*

This course introduces students to the principles of animation through classical animation techniques. Students will explore the art of creating convincing movement through effective timing, spacing, and drawing. Works of master animators will be screened and analyzed frame-by-frame to illustrate the principles covered in class, and students will put their knowledge to work through a series of exercises. The ultimate goal of both this course and its sequel is to introduce methods by which animators "act" and bring characters to life through sequential images.

**ANI 125 Acting for Animation (3 Cr.)**

*Prerequisite(s): None*

An animator's ability to express attitude, thought, and emotion through body language is a fundamental skill necessary for success. Therefore, this course focuses on presenting tools and techniques for translating thoughts and feelings into specific gestures and actions. The course introduces students to the history of acting in the theater, animation, and film. Students will explore the basic fundamentals and differences of acting for the stage, film, and animation through a series of acting exercises and problems. Special emphasis will be given to classical method acting.

**ANI 151 Advanced Animation-Theories and Techniques II (3 Cr.)**

*Prerequisite(s): ANI 101*

In ANI 151 students will continue to explore and exercise the concepts and techniques of classical animation through a series of assignments. The exercises in this course will be considerably more demanding than those completed in ANI 101 as they will be longer and will require more refinement, subtlety, and creativity. There will also be a greater emphasis on character development the expression of personality, mood, thought, and attitude through motion and posing.

**ANI 300 Acting through an Interface (3 Cr.)**

*Prerequisite(s): ANI 125, ANI 151, ART 225, & CG 275*

An animator's ability to express attitude, thought, and emotion through a surrogate is a fundamental skill of animation. This course builds upon the earlier acting curriculum and introduces the traditions of puppetry and marionettes. It next explores stop-motion animation techniques. Finally, students will extrapolate their knowledge to 3D bipedal animation and to solving 2D character animation problems.

**ANI 350 Voice Acting for Animation (3 Cr.)**

*Prerequisite(s): ANI 300*

This course explores the nature of acting through the medium of the human voice. The curriculum will explore narration, expressive reading, diction, and vocal refinement. It will introduce students to basic audio technology and recording equipment. The course also covers lip-synchronization techniques in animation and culminates in a series of practical exercises in both 2D and 3D animation.

**ANI 400 Cinematic Animation (3 Cr.)**

*Prerequisite(s): ANI 350, ART 401, & FLM 275*

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 will work 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.

## ART

### ART 101 The Language of Drawing (3 Cr.)

*Prerequisite(s): None*

This course explores the nature of drawing as a language skill and the use of drawing by production artists and animators. Applied drawing goals and critical thinking skills will be given special consideration. Students will be introduced to basic professional habits in drawing practice, drill, and play. Design principles, basic research, and the design process will be introduced and applied to a series of practical problems. This course also explores basic drawing materials, drawing strategy, drawing sequence, linear drawing methodology, practice, and theory.

### ART 115 Art and Technology (4 Cr.)

*Prerequisite(s): None*

This course provides an overview of art history from Paleolithic times until the modern day. It traces the technological advances of society and art and considers the interplay between art and technology. Classical art materials and methods will be examined, and students will explore how art has historically impacted society. This course has a worldwide scope and is not limited to just European and Western traditions.

### ART 125 Tone, Color, and Composition (3 Cr.)

*Prerequisite(s): ART 101*

This course continues to build upon students' abilities to draw by exploring the nature and use of tone, color, and composition in drawing. It emphasizes methods of creating tone, ways to use luminance as an organizational element, and the importance of thinking critically. Additionally, the course will introduce students to a variety of classical tonal systems and tonal illusions, including atmospheric perspective, sculptural modeling, basic direct lighting, lighting position relative to viewpoint, light intensity, local value, and reflectivity. Students will then explore the artistic use of color. The course will cover systems and traditions of organizing hue and saturation, and it will examine methods of building from tonal preliminary studies. Students also will explore classical forms of compositional organization such as symmetry, asymmetry, golden mean, and figure-ground relationships.

### ART 151 Basic Life Drawing (3 Cr.)

*Prerequisite(s): ART 101*

This course introduces students to the challenges of drawing the human form for animation. Students will examine life drawing for animation in addition to methods for attaining these goals. The course will emphasize capturing skeletal structure, muscle form, emotion, and gesture. Using clothed and nude models of both genders, students will learn to apply lessons in anatomy to the figure, significantly expanding their understanding of human kinetics and structure. Additionally, students will practice extrapolating basic human life drawing strategies to other animals.

### ART 155 Basic Life Drawing and Anatomy (3 Cr.)

*Prerequisite(s): ART 101*

This course introduces students to the challenges of drawing the human form for animation. Students will examine the goals of life drawing for animation, and the instructor will demonstrate methods for attaining these goals. Additionally, students will study human skeletal and muscular anatomy and learn to apply this knowledge to drawing. The course will emphasize capturing skeletal structure, muscle form, emotion, and gesture. Using clothed and nude models of both genders, students will learn to apply lessons in anatomy to the figure and will significantly expand their understanding of human kinetics and structure. Finally, they will practice extrapolating basic human life drawing strategies to other animals.

### ART 201 Advanced Life Drawing (3 Cr.)

*Prerequisite(s): ART 125 & ART 151*

This course builds upon the anatomy and drawing courses students have already taken. Students will continue to improve their ability to capture kinetics in humans and animals. By engaging in a series of exercises designed to enhance their visual memory, students will build the foundation for drawing accurate figures from their imagination. They will also explore putting the figure into an environment, figurative composition, and introductory sequential figurative composition.

### ART 205 Character and Environment Design (3 Cr.)

*Prerequisite(s): ART 155*

Students will apply their drawing and anatomy knowledge to the creation of animation characters. The course will introduce traditions of character design and the basic structural strategies for creating animation characters. Students will explore simplification gradients relative to human, animal, and inanimate object-based characters. The course will also cover issues of costume, personality, and story interaction. Additionally, students will learn to place these characters into appropriately designed environments. The curriculum will emphasize professional applications, techniques, and standards of quality.

### ART 210 Art Appreciation (2 Cr.)

*Prerequisite(s): None*

This introduction to art will provide students with a better understanding of the artistic influences upon our modern culture. Along with the history of art, students will study the meanings, purposes, styles, elements, and principles of art and the various media used to create works of art. In helping students gain basic awareness, knowledge, and enjoyment of the visual arts, the course will provide the groundwork for further personal study in the arts. In turn, this will influence the development of their creativity.

**ART 225 Three-Dimensional Design and Sculpture (3 Cr.)**

*Prerequisite(s): ART 201*

This course introduces students to the principles of 3D design using both traditional and digital tools. Students will become acquainted with additive, subtractive, and cast sculpture. They will consider the basic concepts of architectural space, interior design, landscape design, surface interplay with light, lofted forms, and skinning systems. Students will use modern polymer clays and build an animation maquette.

**ART 230 Painting (3 Cr.)**

*Prerequisite(s): ART 125*

This course explores ideas and various techniques related to painting. The use of color and the representation of space will be emphasized. Students will explore masterworks, studio painting, and painting en plein aire. Technical and social problems related to painting will be explored using portraiture, still life, and environment/landscape. A portable field easel and appropriate painting supplies will be required. The course will culminate in a group show of student projects. (Note: This course is outside of the current Animation curricula and will not count towards graduation requirements. This course is for personal growth and will be offered on a Pass/Fail basis.)

**ART 234 Survey of Sequential Art (3 Cr.)**

*Prerequisite(s): ART 125 or ART 151*

In this course, students will learn to explore and to exploit the power of sequential images as a medium to craft stories beyond storyboarding, photography, and film. Through the formats of the graphic novel and related forms, students will tackle problems of character and events; their solutions will be limited only by their imaginations. The course will begin with an historical overview of sequential art and will then examine storytelling through pictures, focusing on clarity and emotional impact. Students will examine contemporary styles and conventions and will be required to draw from previous art experiences, while honing their skills in drawing, perspective, design, color, typography, writing, editing, and acting. Demonstrations of multimedia techniques and computer technology relative to this field will also be introduced.

**ART 251 Character Design (3 Cr.)**

*Prerequisite(s): ART 201*

Students will leverage their drawing and anatomy knowledge to the creation of animation characters. This course introduces student to the traditions of character design and the basic structural strategies for creating animation characters. Students will explore simplification gradients relative to human, animal, and inanimate object-based characters. They will consider issues of costume, personality, and story interaction. The course will emphasize professional applications, techniques, and standards of quality. The work completed in this course will serve as pre-production design for PRJ 300, PRJ 350, or ANI 300.

**ART 260 Graphic Design, User Experience, and Input (3 Cr.)**

*Prerequisite(s): None*

Students will explore elements of visual design and apply them to computer user interfaces. They will analyze various types of sensory interfaces and improve their skills in creating representations of information valuable to a system user. Additionally, emphasis will be placed on the overall enjoyment of the user experience, plus consideration towards relating the user experience to the theme of the game or system. Students will learn how to use various industry-standard languages related to prototype interfaces.

**ART 299 Special Topics in Art (2 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty or students that is not covered by the courses in the current catalog.

**ART 300 Perspective, Backgrounds, and Layouts (3 Cr.)**

*Prerequisite(s): None*

This course explores the animation pre-production skills of background and layout art. Students will review classical depth cue and perspective systems and apply this knowledge to the creation of animation backgrounds and layouts. Additionally, students will explore means of using drawing to create camera lens illusions, architectural space, theatrical sets, level design, matte painting, and surface texture. The course will emphasize professional applications, techniques, and standards of quality. The work completed in this course will serve as pre-production design for PRJ 300, PRJ 350, or ANI 300.

**ART 310 Architectural Spaces, Design, and Lighting I (3 Cr.)**

*Prerequisite(s): None*

This course introduces students to the aesthetics and principles of 2D (floor plans and elevations) and 3D environment design. A survey of architectural styles from throughout the world will be blended with concepts such as emotion, mood, lighting, shadows, aesthetics, and more. The course will emphasize learning the architectural vocabulary as well as the aesthetics of environmental and game-level design. Texturing, spatial design, negative space, dramatic lighting, and other concepts that affect not only the psychology of level design but also gameplay principles will be covered. Students will experience numerous field trips to local examples of architecture in order to gain an understanding of architectural spaces and the field's vocabulary.

**ART 350 Storyboards (3 Cr.)**

*Prerequisite(s): ART 201, ENG 116, & FLM 151*

This course explores the animation pre-production skills of storyboard art. Students will leverage their knowledge of drawing, storytelling, and cinematography to create both production and presentation storyboards. They will also explore means of using drawing to create story flow, character development, mood, time, and place. The course will emphasize professional applications, techniques, and standards of quality. The work completed in this course will serve as pre-production design for PRJ 300, PRJ 350, or ANI 300.

**ART 360 Architectural Spaces, Design, and Lighting II - Period Styles (3 Cr.)**

*Prerequisite(s): ART 310, CG 301, & CG 320*

This class builds on the foundational skills and knowledge from Architectural Spaces, Design, and Lighting I (ART 310), covering more period styles. Additionally, students will have opportunities to do more hands-on creation of art, models, and textures relative to various periods. Students will participate in a variety of field trips in order to research and analyze architectural styles and then to build them in the computer lab.

**ART 400 Drawing Fundamentals (2 Cr.)**

*Prerequisite(s): None*

The development of strong drawing skills is of extreme importance since they are essential tools for expressing ideas, particularly during the pre-production stages of an animation project. Therefore, this course presents the basic elements of drawing and graphic design in order to improve the student's practical ability to draw with skill and imagination. It will cover methods of observing, describing, and organizing forms using various mediums such as pencil, charcoal, and color pencils.

**ART 401 Conceptual Illustration and Visual Development (3 Cr.)**

*Prerequisite(s): ART 300*

This course explores the animation pre-production skills of conceptual illustration and visual development. Students will apply their knowledge of drawing, storytelling, and composition to create speculative drawings for animation. They will review compositional systems, design process, and illustration techniques. Additionally, students will explore means of using drawing to visually explore story and character ideas from both existing and original story materials. They will also consider adaptation, stylization, and visual variety. The course will emphasize professional applications, techniques, and standards of quality. The work completed in this course will serve as pre-production design for PRJ 300, PRJ 350, or ANI 300.

**ART 410 Mechanical Drawing (3 Cr.)**

*Prerequisite(s): None*

Traditional and digital skills in drafting are key components of an engineering career. This course introduces students to the basic skills of mechanical drafting including layout and formatting conventions, typographic traditions, and classical drafting tool usage. Students will apply these skills to actual problems in traditional mechanical drafting. They will then be exposed to modern digital tools in mechanical drafting. The course will explore subjects such as interface conventions, usage strategies and output options. Students will work with a CAD program and complete a variety of exercises designed to establish foundational skills. The course will pay special attention to addressing how professionals use these skills in production and prototyping.

**ART 450 Portfolio (3 Cr.)**

*Prerequisite(s): PRJ 350*

Students will use this course to compile the elements of their professional portfolio, which will serve as their B.F.A. thesis. Additionally, this course will introduce students to the marketing campaign needs of modern animation portfolios including visual continuity, business documents, traditional still art portfolios, process and practice samples, digital portfolios, web sites, demo reels, and promotional items. They will use this knowledge to assemble their own portfolios. The course will also cover related information regarding job interviews, trade shows, professional standards, and contract negotiation.

## COMPUTER GRAPHICS

**CG 105 Introduction to 3D Graphics (3 Cr.)**

*Prerequisite(s): None*

This course covers all of the general principles of computer graphics, introducing students to the primary 3D computer animation software used to create the various productions. In addition, students will learn how to use a 2D paint package for the creation of maps. Topics will include general subjects such as file management, traditions of interface structure, strategies for learning new software, and tactics for staying abreast of software evolution. Additionally, the course will introduce students to animation specific topics including modeling, materials, lighting, rigging, cameras, animation, and output.

**CG 201 Two-Dimensional Raster Graphics and Animation (3 Cr.)**

*Prerequisite(s): ANI 151, ART 101, & ART 125*

This course introduces students to the industry-standard software and practices of raster graphics and animation. The course begins with basic information such as interface organization strategies, system components, bit depth, resolution, memory management, and output strategies. Then it explores techniques and critical thinking skills for digital painting, scanning, still compositing, and texture creation. Additionally, it looks at basic interface customization options and strategies in 2D raster graphics.

**CG 202 Two-Dimensional Raster Graphics and Animation for Designers (3 Cr.)**

*Prerequisite(s): ART 101 & ART 125*

This course introduces students to the industry-standard software and practices of raster graphics and animation. The course begins with basic information such as interface organization strategies, system components, bit depth, resolution, memory management, and output strategies. Then it explores techniques and critical thinking skills for digital painting, scanning, character development and animation for 2D games. Additionally, it looks at basic interface customization options and strategies in 2D raster graphics.

**CG 225 Introduction to 3D Animation (3 Cr.)**

*Prerequisite(s): ANI 151, ART 101, & ART 125*

This course introduces students to the industry-standard software and practices of 3D animation. The course begins with basic information such as interface organization strategies, equipment options, and production elements. Then it introduces techniques and critical thinking skills for texture mapping, modeling, rigging, lighting, cameras, and animation. Additionally, it looks at basic interface customization options and strategies in 3D graphics, culminating in a series of applied problems in 3D production techniques.

**CG 251 Two-Dimensional Vector Graphics and Animation (3 Cr.)**

*Prerequisite(s): CG 201*

This course examines the principles and practices of 2D vector graphics and animation. It will introduce students to industry standard software, output options, and production strategies for using vector graphics in both graphic design and animation. The course will give special consideration to critical thinking and refinement strategies when modifying vector images. Students will examine methods of using vector-based tools for creating web and broadcast animation, and the course concludes with a series of applied problems in 2D vector animation.

**CG 252 Foundation Scripting for 2D Vector Animation (3 Cr.)**

*Prerequisite(s): CG 251*

In this course, art students learn to script interactive 2D animations to produce simple games. While game authoring is the focus for this course, the skills to be gained have universal applications in interactive media design. Studies begin with foundation concepts and carry through to more complex work that uses up-to-date, object-oriented scripting. Students learn to translate basic game concepts into interactive, scripted terms suitable for deployment on the internet.

**CG 275 Three-Dimensional Character Animation (3 Cr.)**

*Prerequisite(s): CG 105 or CG 225*

Students will continue to explore and exercise the concepts and techniques of 3D animation through a series of assignments applied to characters. Exercises in this course will be considerably more demanding than those completed in CG 125 as they will be longer and require more refinement, subtlety, and creativity. The course will emphasize character development - the expression of personality, mood, thought, and attitude through motion and posing. It will also give special consideration to proper model rigging.

**CG 300 Three-Dimensional Environment and Level Design (3 Cr.)**

*Prerequisite(s): CG 275*

This course introduces students to the principles of 3D environment design. Theatrical sets, architectural simulations, and level design will all be considered. In order to provide students with a broader skill set, this course also presents the "mechanics" of how to use another 3D animation program, with an emphasis on the unique strengths of the package. Students will explore the comparative strengths of different software packages and the impact that this has on workflow. The course will emphasize critical thinking skills and strategies for tool selection.

**CG 301 Environments and Backgrounds (3 Cr.)**

*Prerequisite(s): CG 275*

This course explores the design of an evolution of place. It focuses on analyzing, understanding, and learning to create structure and rules as organizational devices for level design. The course encompasses both the built and natural worlds, focusing on the reasoning and history behind their appearance. Particular emphasis is placed on the crafting of cinematography designed for viewer immersion, encompassing lighting, climate, natural and artificial forces, and social and cultural influences. Students will identify and classify urban, regional, and national archetypes and understand the causes of their evolution as a foundation for designing worlds yet unseen.

**CG 320 Materials and Lighting (3 Cr.)**

*Prerequisite(s): CG 275*

In this course, students will develop a deep understanding of computer-generated lighting methods and cinematography. This will involve investigation of arbitrary lighting as well as physically based lighting using global illumination solutions. Additionally, students will explore the creation of materials and shader trees for both realistic and stylized designs. This class supports the game project classes, contributing shaders and lighting for both rendered cinematics and for baking as in-game textures.

**CG 340 Game and Cinematic Textures (3 Cr.)**

*Prerequisite(s): CG 201 or CG 202*

Building on the foundational knowledge from CG 201 and CG 202, this course delves deeply into the art and science of painting textures and backgrounds for games and digital back lots. Students will focus on generating multiple maps for materials to define complex shader properties. Emphasis will also be placed on effective texture layout and detail for use in games and cinematic applications.

**CG 350 Graphics for Gaming (3 Cr.)**

*Prerequisite(s): CG 300*

This course examines the unique problems of creating graphics for games, and it teaches effective production techniques for addressing these issues.

**CG 400 Advanced 3D Modeling Techniques (3 Cr.)**

*Prerequisite(s): CG 275*

This course will focus on the design and production of highly detailed models for use in feature and broadcast animation. Students will use a best-of-breed approach to define their tool set, with particular emphasis placed on organization and structure. Additional emphasis will be placed on generating layered digital intermediate files for use in a model-composite workflow in a desktop production environment. Lectures will also cover environment and character design research as relevant to detail modeling, presented in a framework of industry-standard geometries and methods. Students will also explore advanced material creation using a global illumination-capable rendering engine, incorporating advanced texture creation techniques.

## FILM

**FLM 115 History of Film and Animation (3 Cr.)**

*Prerequisite(s): None*

This course examines the more than 100-year history of film and animation. Beginning with the scientific and technical advances that made these media technologies possible, students will explore every major movement and genre as well as their impact on society. The course will give special consideration to examining all of the various professional outlets for this technology.

**FLM 151 Visual Language and Film Analysis (3 Cr.)**

*Prerequisite(s): None*

Animation is ultimately "film making," and animators should learn from the many classics on how to effectively bring various film production elements together. Students will review several films and study how the relationships between scripts, cameras, lighting, sets, production design, sound, acting, costumes, props, directing, and production lead to successful visual stories. They will also examine the fundamental theories underlying visual storytelling. Understanding the creative processes utilized by these influential filmmakers will provide insight into how students may improve their own animations.

**FLM 201 Cinematography (3 Cr.)**

*Prerequisite(s): FLM 151*

Like a director of photography, computer animators must have a good understanding of appropriate camera composition and lighting techniques to enhance the visual impact of the story being told. Appropriate composition and camera movement help to reveal action, and lighting establishes focus, place, and mood. Students will analyze examples of effective cinematic techniques from a variety of different animations and films. Assignments in camera composition, movement, and lighting will help students solidify their understanding of the concepts presented.

**FLM 250 Digital Post-Production (3 Cr.)**

*Prerequisite(s): FLM 151*

The last step of any animation project involves the assembly of various production elements ranging from rendered files to sound effects. This is also the stage where the visual effects artists add the effects seen in today's movies. This course teaches the fundamental skills these artists use in post-production. Effective editing skills are the primary outcome of the course. Students will also cover the planning, execution, and addition of special effects to animation.

**FLM 275 Fundamentals of Music and Sound Design (3 Cr.)**

*Prerequisite(s): None*

Every good animation relies on a well-designed soundtrack to enhance the production. While most animators do not produce the soundtrack themselves, they need to understand the effect of music, voice, and sound effects on an audience. Animators must be able to communicate their ideas to a musician and understand the technological possibilities of modern sound design. Initially students will survey a broad range of music from different cultures. Emphasis will be on developing basic listening skills in hearing rhythm, melody, harmony, color, texture, and form. Students will then learn how to apply this to the production needs of animation. The course will give special attention to the generation of sound, how to use sound to advance a story, and how it can create mood, a sense of place, and emphasis.

There may be course fees associated with this class. Please see the course registration packet for details.

## PROJECTS

**Projects Note 1:** If one hopes to be a successful professional, it is insufficient for an animator to only understand the theory of animation and art. He or she must also understand the rigors and demands of commercial animation production. The projects classes create academic production environments where students learn the principles, practices, and habits that will help them adapt readily to the demands of the commercial animation industry. Each projects class focuses upon a series of related production problems and culminates in the students generating professional-quality work on a rigid deadline. This work will serve as the foundation for their graduation portfolios. Weekly production meetings with an instructor ensure that the production stays on schedule and that students maintain professional-quality standards.

**Projects Note 2:** Generally, students decide the subject of the projects class animations, but the instructor must consider the undertaking within the scope of a student's skill set, commercial marketability, academic soundness, and appropriateness in nature. DigiPen reserves the right to refuse any student production proposal that it deems inappropriate. Students are also expected to maintain an exceptional level of professionalism within these production environments, striving to produce quality work. Failure to meet this standard may result in academic discipline.

**PRJ 105 Introduction to 3D Production (4 Cr.)**

*Prerequisite(s): None*

PRJ 105 introduces students to the basic concepts of the production process utilizing small-scale applied problems in 3D animation. Additionally, students will learn how to work within the professional animation production pipeline, which they must successfully navigate in order to achieve professional results and hone their professional critical thinking skills. The course culminates in students creating the pre-production work for their PRJ 155 project.

**PRJ 155 Personal 3D Production (5 Cr.)**

*Prerequisite(s): PRJ 105*

PRJ 155 addresses two of the more serious emotional challenges facing commercial animators: professional focus and realistic expectations. Animation is a team sport, and it requires a significant commitment of time and resources to accomplish even the most mundane tasks. During this course, students will face a series of choices. Each student will use the pre-production work they created in PRJ 105 to generate a single piece of limited animation. They must limit themselves to a production scale that allows for extensive professional refinement and meets the stringent specification criteria established by the faculty. Students will be introduced to realities of commercial art direction and quality control in conjunction with production deadlines. They should be prepared to repetitively revisit the same material with a relentless attention to subtle detail.

**PRJ 201 Two-Dimensional Animation Production (5 Cr.)**

*Prerequisite(s): ANI 151 & ART 125*

This is a traditional animation course within the context of a small-production pipeline. This project builds on the cumulative skill sets acquired in ANI 101 and ANI 151 but with a focus on team dynamics rather than individual projects. Students will be responsible for interpreting the initial animatic, storyboards, and workbooks, breaking down sound and music onto exposure sheets, and completing rough and cleaned up animations for a final rough composite. This will require each cohort to learn choreography, continuity, and basic scene analysis, all while working within the confines of a team. New dynamics will come into play, particularly in terms of accountability to small and large groups, as well as increased responsibilities with man-hour projections and general scene management.

**PRJ 205 Team Projects (5 Cr.)**

*Prerequisite(s): PRJ 155*

This course introduces students to the realities of team-based production environments. Each student will pitch a proposed team project to the faculty and the class for consideration. (Select RTIS program junior and senior level projects may also be presented by academic approval.) The animation faculty will then decide which team projects will be produced and will assign students to specific teams based upon their artistic strengths and career goals. Each team will be assigned a primary and secondary faculty advisor. Each student's individual effort will be assessed as well as the overall success of each team. All members will be evaluated for the overall teamwork and professional success of the group. Just like a professional work environment, student teams will not be allowed to jettison individual members due to production conflicts or performance. Only the faculty will possess the ability to remove a team member for failure to perform.

**PRJ 251 Two-Dimensional Vector Animation Production (5 Cr.)**

*Prerequisite(s): PRJ 201*

Building on the working rough reel, students will use an industry-standard digital animation tool to convert the drawings to vector-based images. Students will then focus on character and effects clean-up work to complete the final, polished version of the project. The course will give special consideration to workflow projections, scheduling, time management, administrative documentation, and quality control. Additionally, it will emphasize appropriate work habits.

**PRJ 255 Final Projects (5 Cr.)**

*Prerequisite(s): PRJ 205*

Students will use this course to complete an independent or team project. This project will help round out a student's portfolio and will demonstrate an appropriate level of professional challenge. These projects may focus on any aspect of 3D digital animation. Students will contract with the faculty about the content of their project. Completed projects will assist students in marketing their skills and knowledge to a specific animation industry segment upon graduation.

**PRJ 300 Limited-Scope 3D Production (5 Cr.)**

*Prerequisite(s): CG 275 & PRJ 251*

PRJ 300 addresses two of the more serious affective learning challenges facing commercial animators: professional focus and realistic expectations. The goal of this course is to build on the experience gained in production pipeline procedures in PRJ 201/251 as well as the modeling and animation skills developed in CG 225 and CG 275. Students will apply skills learned concurrently in ART 300 and CG 300 to produce an animated short film of limited duration.

**PRJ 350 Three-Dimensional Animation Production (5 Cr.)**

*Prerequisite(s): ART 300, CG 300, & PRJ 300*

PRJ 350 is a continuation of the production started in PRJ 300 where students have completed the pre-production phase of their projects. Students will now focus on completing the work on their projects through to final rendering and post-production. Students will address the realities of commercial art direction, quality control, and production deadlines, as well as technical challenges.

**PRJ 400 Capstone Project I (5 Cr.)**

*Prerequisite(s): ART 350, ENG 116, PRJ 350, & Senior class standing*

Working effectively as producers, the Animation Faculty team will select from student submissions one or more team projects to be produced. They will then assign students to specific teams, based upon their artistic strengths and career goals. Wherever possible, individual students will be introduced to specialist advisers from outside the faculty.

Each student's individual effort will be assessed as well as the overall teamwork and professional success of the team. As in a professional work environment, student teams will not be allowed to exclude individual members due to production conflicts or performance. The faculty alone will retain the right to remove a team member for failure to perform.

**PRJ 450 Capstone Project II (5 Cr.)**

*Prerequisite(s): ART 401, PRJ 400, & Senior class standing*

Having completed the pre-production work for a team-based animated production in PRJ 400, students will complete final rendering and post-production. Students will face the challenges of commercial art direction, quality control, production deadlines, and team dynamics, as well as the many technical challenges.

**PRJ 475 Summer Animation Team Production (3 Cr.)**

*Prerequisite(s): Interview by permission of department chair, Portfolio evaluation, & Two full-time semesters*

This advanced projects class will allow students to gain invaluable experience and knowledge on a short animated film (approximately one to two minutes) in a professional production setting. The instructor will direct and supervise the film, and students will carry out staff roles as designers, layout/ lighting artists, animators, riggers, modelers, and texture artists. This is an opportunity for students to work in a professional setting, which fosters responsibility, teamwork, and artistic excellence.

# Department of Game Software Design and Production

## GAME SOFTWARE DESIGN AND PRODUCTION

**GAM 100 Project Introduction (3 Cr.)**

*Prerequisite(s): None*

This class presents an overview of the way the game development industry works and a history of game development. It will expose students to the positions and job responsibilities that each member of a game development team has along with the industry requirements for the creation of a game design document (GDD) and a technical design document (TDD). Over the course of the semester, the instructor will organize students into teams responsible for designing and developing text-based games, complete with a functional GDD and TDD, schedule, and milestones. Additionally, each student will create individual games using the ProjectFUN game development environment created by DigiPen. Games created via ProjectFUN will be graphical in nature, serving to enhance the student's retention of C/C++ coding techniques and math functions taught in the first semester CS and MAT classes.

**GAM 150 Project I (3 Cr.)**

*Prerequisite(s): CS 120 & GAM 100*

Continuing with the teams to which they were assigned in GAM 100, each team will prepare a GDD and TDD for one team-based project. Teams will complete the approved game design according to the schedule they will establish in their technical design. They will present these completed games to the Institute during the final week of the semester. Additionally, each student will design and develop smaller projects using a variety of tools. These projects reinforce the game design and implementation curriculum.

**GAM 200/250 Project II (4 Cr.)**

*Prerequisite(s) (GAM 200): CS 170, CS 230, GAM 150, & MAT 140*

*Concurrent Course(s) (GAM 200): CS 200*

*Prerequisite(s) (GAM 250): CS 225 & GAM 200*

This project is divided into two semesters and focuses on the creation of a simple real-time game/ simulation with 2D graphics for the PC platform (3D games are not allowed). Students will work together on teams of three or four members and implement technical features such as audio effects, music playback, pattern movement, simple artificial intelligence, same-machine multiplayer (networking is not allowed), particle systems, scrolling, and simple physics. All projects must be written with a core of C/ C++ code and cannot use middleware such as pre-existing physics engines, networking engines, etc. In addition, students will continue to learn about effective team communication, planning, documentation, play-testing, and iterative software development techniques.

**GAM 300/350 Project III (5 Cr.)**

*Prerequisite(s) (GAM300): CS 200, CS 260, CS 280, GAM 200/250, & PHY 200*

*Prerequisite(s) (GAM 350) - GAM 300*

*Concurrent Course(s) (GAM 350): CS 250*

This project is divided into two semesters and focuses on the creation of an advanced real-time game/simulation with 3D hardware-accelerated graphics for the PC platform. R.T.I.S. students will 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/C++ code and cannot use middleware such as pre-existing physics engines, networking engines, etc. In addition, students will continue to learn about effective team communication, planning, documentation, play-testing, and iterative software development techniques.

**GAM 301/351 Project for Game Designers (5 Cr.)**

*Prerequisite(s) (GAM 301): Enrollment in B.A.G.D. or B.S.G.D., GAT 250, & GAT 305*

*Prerequisite(s) (GAM 351): GAM 301*

This year-long project - divided into two semesters, GAM 301 and 351 - will focus on the design and development of a simulation-type game, complete with artificial intelligence, networking, and physics. A large portion of this course focuses on AI-related research and the requirements for AI in games, from a simulation perspective. Students will be required to model physics in their projects. Additionally, students will learn about networking up to eight players on a LAN. Designers in this course will work with R.T.I.S. teams as the designer and level designer. Topics for the Game Design students include project management, team work, and the development cycle, as well as a high-level understanding of the technologies involved in making a complete game from concept to completion.

**GAM 390/490 Internship I/II (5 Cr.)**

*Prerequisite(s): GAM 200/250 & GAM 300*

An internship is any carefully monitored work or service experience in which an individual has intentional learning goals and reflects actively on what she or he is learning throughout the experience. It is usually a professional activity under general supervision of an experienced professional and in a job situation, which places a high degree of responsibility on the student. Internships are well structured along the Internship Guidelines available in the Administration Office.

**GAM 399 Special Topics in Game Software Design and Production (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty or students that is not covered by the courses in the current catalog.

**GAM 400/450 Project IV (5 Cr.)**

*Prerequisite(s) (GAM 400): CS 250 & GAM 300/350*

*Concurrent Course(s) (GAM 400): GAT 300*

*Prerequisite(s) (GAM 450): GAM 400, GAT 300, and MAT 300*

This project is divided into two semesters and focuses on the creation of an innovative game/simulation/demo using the latest software and hardware technologies available. This includes using web technologies, gaming consoles, mobile devices, commercial physics engines, etc. to implement technical featur such as 3D animation, advanced lighting and rendering, full 3D physics, high-performance networking, and advanced AI algorithms. Innovation can also come from the design, visuals, and/or audio components of the project. Students will work independently or in teams, as appropriate to the scope of their project. Additionally, students will learn important professional skills, including working in a real job, interviewing, preparing resumes, networking, and strategizing for accomplishing one's career goals.

**GAM 541 Master's Game Project I (3 Cr.)**

*Prerequisite(s): CS 529*

In this course, students will work in teams to create a first playable of a game/simulation, including marketing materials. Topics covered will include the business side of the game industry and the marketing of games. Teams will present their projects to focus groups and present analyses of their responses. Successful completion of the project will require a marketing plan and game packaging materials (box, manual, and sell sheet). At the completion of the project, the team will be required to generate a postmortem of the process.

**GAM 550 Master's Game Project II (3 Cr.)**

*Prerequisite(s): GAM 541*

This course challenges students to research the latest techniques in game design and technology and to apply their findings in a 3D game/simulation. Students will investigate issues in 3D techniques, artificial intelligence, and next-generation game console architecture, as well as such advanced game design issues as massively multi-player persistent worlds, input/GUI theory and design, and advanced simulation theory and applications. Students will report their results to the class and present a pitch paper for a product that incorporates their findings both to the class and a faculty review board. Students will then create a game design document and technical design document for the approved project. Depending on the scope of their projects, students will work individually or on teams. By the end of the semester, students should complete a prototype of their game/simulation.

**GAM 551 Master's Game Project III (3 Cr.)**

*Prerequisite(s): GAM 550*

At the completion of the GAM 551 project, students will have a fully functional game/simulation, complete with a manual and marketing material. Topics covered in this course will include advanced team leadership skills, short-term project budgeting, long-term financial planning, and legal issues related to the game industry. Teams will present their projects in pre-beta version to focus groups and analyze their responses. Successful completion of the project will require a multimedia presentation of the finished title and a marketing plan to a creative board. At the completion of the project, the team will generate a postmortem suitable for submission to an online game development site.

## GAME APPLICATION TECHNIQUES

**GAT 110 Game History (3 Cr.)**

*Prerequisite(s): None*

The earliest known games were mostly played by the aristocracy, who had leisure time available for such pastimes. As the middle class also gained more leisure time in the nineteenth century, mass-market board games became popular and led to the establishment of some of the best-known game companies, like Parker Brothers and Milton-Bradley. The invention of the computer in the mid-twentieth century allowed even more people the chance to play new and different kinds of games. Since then, games have become a major force in entertainment and challenged movies, television, and other arts for the leisure time of a vast audience. This course examines these developments in detail and offers students the chance to analyze why some games have been more successful than others.

**GAT 210 Game Mechanics I (3 Cr.)**

*Prerequisite(s): None*

The simplest types of games are board and card games. In this course, students will examine the basic math and rules that make these simple games enjoyable. Additionally, students will use this theoretical knowledge to create simple yet practical games that show their comprehension of what is enjoyable in games. They will then present their concepts to the class and will hold focus groups to test their basic design assumptions. Once they have mastered the basics of physical game mechanics, they will expand their expertise by looking at various arcade-action games and other simple action games. They will then create prototypes of games and will hold focus groups to get feedback about their designs.

**GAT 211 Game Mechanics II (3 Cr.)**

*Prerequisite(s): GAT 210*

In this course, students will determine how simulation games abstract the reality they portray in game form and focus on how a designer incorporates the most enjoyable yet challenging aspects into a design. Students will examine published games in these genres to learn what game mechanics are involved and how the extensive database is used to drive gameplay. In addition, students will analyze the structure of interactive stories and branching dialogue. They will learn how to incorporate various puzzles into interactive stories. During the semester, each student will present two in-class reports on commercial simulation and story-telling games, focusing particularly on the unique game mechanics of each product. Additionally, students will create prototypes for four games (racing/flight/sports game, war game, role-playing game, and adventure game).

**GAT 240 Technology for Designers (3 Cr.)**

*Prerequisite(s): None*

This course covers many of the technical issues required for game design. Students will learn basic concepts about how games are implemented from a technical viewpoint. After a brief review of computer components, students will learn about game-engine architecture and the importance of data-driven coding. Other topics that may be covered include 2D graphics concepts such as sprites, animation sequences, palettes, and file formats. This course also provides a deeper examination of the art pipeline for both 2D and 3D. A networking overview introduces such concepts as internet protocols, message types, database management, and client/server and peer-to-peer networking. Development of audio for games will be examined, including such topics as file formats, compression/decompression, streaming, interactive and 3D audio, and recording voices and music.

**GAT 250 Two-Dimensional Level Design - Introduction (3 Cr.)**

*Prerequisite(s): GAT 210*

In this course, students will work individually, using an existing game engine(s) to build multiple levels first for a puzzle/arcade game and then for an action game. Students will go through an iterative process to individually create the levels and gain a sense of progress throughout the games. The course combines lectures, hands-on level creation, focus groups, and opportunities for feedback. Lecture topics include level design and overviews of 2D game engine technology, including game engines, architecture, game loop, clock, and modular coding. The course also covers an introduction to 2D art and architecture in games, the use of art and audio (SFX and music) in games, writing concept documents, pitching concepts, and writing scrum-like milestones.

**GAT 251 Two-Dimensional Level Design - Documentation (3 Cr.)**

*Prerequisite(s): GAT 250*

Picking up where GAT 250 left off, students will work in teams, using an existing game engine(s) to build multiple levels first for an RPG and then for a genre of their choice. Students will go through an iterative process to individually create the levels and gain a sense of progress throughout the games. The course combines lectures, hands-on level creation, focus groups, and opportunities for feedback. Lecture topics include RPG level design, missions, and quests; radial, branching, and bottleneck level-design patterns; adventure and story game level design, dialog design, dialog trees; introduction to NPC design; vehicle simulation level-design issues; military mission design; and issues in sports level and mission designs.

**GAT 300 3D Computer Animation Production I (3 Cr.)**

*Prerequisite(s): None*

This course introduces students to the basic theories and techniques of 3D computer animation. The curriculum emphasizes standard 3D modeling techniques, including polygonal and spline modeling, texture map creation and application, keyframing, and animating through forward kinematics and inverse kinematics. Earlier catalogs listed this course as GEN 300.

**GAT 305 Three-Dimensional Level Design I (3 Cr.)**

*Prerequisite(s): None*

This course is an introduction to the art and science of applied 3D game design. Students will learn how and why design decisions impact both players and gameplay. Students will then apply that understanding through the creation of fully functional levels for a professional real-time strategy game. Topics will include various issues in level design, such as aesthetics, resource balancing, and supporting game mechanics.

**GAT 310 Three-Dimensional Level Design II (3 Cr.)**

*Prerequisite(s): GAT 305*

This course builds and expands upon the design theory and concepts taught in GAT 305. Using third-party tools, students will work to design and implement fun and balanced FPS levels. Topics covered will include aesthetics, resource placement in a 3D environment, and goal-oriented player guidance.

**GAT 350 3D Computer Animation Production II (3 Cr.)**

*Prerequisite(s): GAT 300*

This course builds on the fundamentals taught during GAT 300. Students will learn about key framing, special effects, final rendering, and recording.

**GAT 388 Portable Game System Programming -- Introduction to Portable Game System Development (3 Cr.)**

*Prerequisite(s): CS 250 & GAM 250*

This course introduces students to portable game system programming, which is different from PC programming due to the embedded system of the machine. Students will learn to deal with a very limited amount of memory and CPU power, as well as programming for a limited graphics engine. Additionally, students will learn how to use the 3D graphics engine of a portable game system and how to merge both 2D and 3D objects into the same buffer. During the course, several topics specific to portable game systems will be discussed, such as wireless capabilities and sound/character recognition functionality.

**GAT 399 Special Topics in Game Application Techniques (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

**GAT 39x Serious Games (3 Cr.)**

*Prerequisite(s): GAM 200/250 & Other courses, as appropriate*

This is an interdisciplinary course which varies from semester to semester. The focus will be on some aspect of serious games, for example: the study of serious games that have been implemented in specific industries or fields (medicine, military, education, etc.); or an actual design and implementation of a serious game project with content coming from another department (Math, Physics, etc.) The course will typically be co-taught by instructors from several departments.

**GAT 400 Multimedia Aspects of Game Making I (3 Cr.)**

*Prerequisite(s): None*

This course introduces students to high-level tools for rapid prototyping of creative, interactive, multimedia experiences. Students will learn current technologies for web development or for small, portable games. Additionally, students will learn the design, development, and iterative processes commonly used for developing web-based game applications and other multimedia presentations.

**GAT 450 Multimedia Aspects of Game Making II (3 Cr.)**

*Prerequisite(s): None*

Students will study various languages, tools, and techniques to make a variety of multimedia and games ranging for casual online games, to making interactive game Web sites, to using databases to support online games. Tools include scripting languages, commercially available databases, and commercially available middleware. Students will create multiple projects, including the creation of a game, interactive portfolio, or Web site. Earlier catalogs listed this course as GEN 450.

**GAT 480 Senior Portfolio (1 Cr.)**

*Prerequisite(s): Completion of 100 semester credits*

This one-credit course covers portfolio development for game designers. Students will organize and present their work in online, paper, and electronic media. Resumes, cover letters, interviewing, and job preparation skills are also covered.

**GAT 488 Console Programming - Introduction to Console Development (3 Cr.)**

*Prerequisite(s): CS 350 & GAM 350*

This course introduces students to the game development process on a gaming console platform. It covers both the technical features and design considerations of console development. Topics covered include an overview of game console hardware and comparison with the PC environment, memory management, asynchronous data loading, graphics API, reading optical and motion sensor data, optimization, and NAND data management. As students learn the material, they will work on a game project that takes advantage of the unique capabilities of gaming consoles.

# Department of Humanities and Social Sciences

## COMMUNICATIONS

### COM 150 Interpersonal and Work Communication (3 Cr.)

*Prerequisite(s): ENG 110 or Equivalent*

Students will explore how their culture, gender, economic status, age and other personal characteristics influence their work communications. The course will explore verbal and non-verbal communication skills in a global work environment. Students will learn written communication techniques most effective for use in the technology workplace. Additionally, students will explore and practice negotiation skills, both internally and externally to their workplace.

## ECONOMICS

### ECN 350 Engineering Economics (3 Cr.)

*Prerequisite(s): None*

This course will give students a sound basis for making economic decisions in business and industry environments. Students will learn how to decide which projects are worthwhile, determine priorities, and select components. Topics in this course include present worth; future amounts; cash flows; salvage value; depreciation; rates of return; income tax; basic cost accounting; and funding sources, including venture capital and SBIR. The course will also cover the basics of intellectual property, patents, and copyright.

## ENGLISH

### ENG 110 Composition (3 Cr.)

*Prerequisite(s): None*

George Leonard, a leading writer on education, wrote, "To learn is to change. Education is a process that changes the learner." Writing is also a process that changes the writer. In this practical course in composition, students will spend time generating ideas for writing, sharing and critiquing their writing and ideas, revising their ideas, and learning more about themselves as a result. The course will emphasize using writing as a tool to explore and discover their thought processes, beliefs, and world concepts. Students will employ writing as a tool to develop critical thinking skills. In the process of organizing ideas and, subsequently, manifesting those ideas into various compositional styles and forms, students will become conscious of the concepts which have shaped and are continually shaping their personal realities.

### ENG 116 Storytelling (4 Cr.)

*Prerequisite(s): None*

Storytelling is one of the oldest art forms, yet narrative— the description of an event—is also one of the most complex human endeavors. The art of narrative is endless, and we have created an almost boundless number of forms for telling stories: gesture, speech, writing, painting, photography, cinema, television, comics, newspapers, music, theater, and video games. Contemporary narrative strategies and structures share much in common with the most archaic of storytelling traditions. This course begins by investigating the psychosocial drive to tell stories, and proceeds to examine how the principal elements of narrative assert themselves in a variety of narrative genres and across different media.

Students will explore the rhetoric of narrative in its many guises, and gain an appreciation for both classical and contemporary formulations of story structure. In particular, this course focuses on how narrative may be adapted across media and genres. A series of written assignments focuses on the demands of storytelling made by different genres. Such a study discloses the particular attributes of each genre, and exposes the inextricable bond between narrative form and narrative content. Additionally, we will consider several ways to interpret narrative, negotiate the temporal restrictions of commercial storytelling applications, and begin to think about the ethics of storytelling.

### ENG 150 Mythology for Game Designers (3 Cr.)

*Prerequisite(s): ENG 110*

The power of myth resides in its ability to touch the essence of our humanity and put meaning into our lives. Artists, filmmakers, game designers, and writers have appropriated elemental mythological premises and updated them to create modern myths accessible to contemporary audiences. Whether we are playing a role-playing game wherein the task is to rescue the princess and save the planet, reading the latest cyberpunk novel, or watching an animated Disney classic, the power of mythology touches our psyches. This course is an overview and analysis of cross-cultural mythology presented as poetry, prose, film, drama, and game. This class will provide an in-depth discussion of the idea that myths have influenced cultures of the past and continue to inform and influence our culture today. It also will examine the practical use of myth. Additionally, it will emphasize the mono-myth of the hero's journey and how a game developer may redefine the archetypal figures and adventures therein and incorporate them in a game design. One central aim of this course is to identify the many characteristics of the hero and suggest reasons why the hero is such a common figure in disparate traditions.

**ENG 242 Multicultural Literature (3 Cr.)**

*Prerequisite(s): ENG 110 & ENG 150, or Equivalent*

This course explores what modernity and post-modernity have or have not meant to American writers whose histories and cultures are not European in origin but whose writings are steeped in European- American literary traditions. The course explores the cultural hybridism of this literature as well the unique visions of the world they have created. These funny, humorous, bitterly satirical, and downright serious (post)- modern fantasies are quintessentially American, yet also unique and peculiar to these authors' ethnic experiences. The selected works also offer an opportunity to read or re-read well established and newer American works of literature.

**ENG 243 Epic Poetry (3 Cr.)**

*Prerequisite(s): ENG 110, ENG 116, or ENG 150*

This course provides an introduction to the literary form of the epic poem. Students will gain in-depth knowledge of the form and will apply this experience by adapting the epic's themes and structures into their own creative endeavors, including video games. Students will also produce an epic-based creative work as a final project in the course.

**ENG 245 Introduction to Fiction Writing (3 Cr.)**

*Prerequisite(s): ENG 110*

This course provides an introduction to the study and practice of fiction writing. Students will learn how to analyze characterization, plot, point of view, and other elements of fiction by reading a variety of stimulating works of short fiction. In examining the elements of fiction, students will gain the insights and skills they need to write compelling fiction of their own. Students will complete weekly writing assignments, as well as two full-length short stories. In addition, students will learn how to give and how to receive constructive criticism regarding their creative work. Although the focus will be on the form of the short story, we will also discuss how narrative is employed in graphic storytelling and video games. By the end of the course, students will gain confidence in their ability to analyze, to discuss, and to write short stories. They will acquire a deeper understanding of the creative process, particularly as it applies to writing.

**ENG 315 Story through Dialogue (4 Cr.)**

*Prerequisite(s): ENG 116*

Dialogue is more than just what people say; dialogue is a crucial element that animates contemporary narrative genres, including fiction, graphic novels, film and television, drama, and even video games. Through an intensive reading of fiction and critical texts, film screenings, written and oral exercises, and a series of workshops, this course aims to provide students with an introduction to the centrality of dialogue in a variety of narrative genres. One central aim of this course is to identify the characteristics of effective dialogue and the role dialogue plays in crafting action, characterization, and theme in different narrative modes. Students will also be coached to consider reading texts or viewing films as a dialogic exercise—a give and take between reader/viewer and text. Additionally, students will learn traditional dialogue and scripting formats and utilize them in their written work, with the eventual goal of producing a pre-production script proposal. This course offers students an opportunity to participate in a hybrid literature-writing class that provides the invaluable experience of reading closely, writing often, and reflecting upon their work in a supportive environment.

**ENG 340 Creative Writing across the Arts (3 Cr.)**

*Prerequisite(s): ENG 110 or ENG 116*

This course focuses on the generation of creative writing in multiple genres and media, including poetry, fiction, creative non-fiction, and graphic novels. Students will study and practice writing in a workshop atmosphere and will engage in intensive reading of excellent writings, most of which employ interdisciplinary, cross-genre approaches that encompass painting, photography, and other visual art. We will follow discussions of readings with writing experiments designed to spark original thinking, to develop facility with writing, and to enhance understanding of the creative process. Students will gain in-depth knowledge of the possibilities of creative writing and will apply this experience by writing both short creative pieces and longer works.

**ENG 399 Special Topics in English (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

**ENG 400 Creative Writing for Game Design (3 Cr.)**

*Prerequisite(s): ENG 110 or ENG 150*

This course will focus on the narrative elements of creative writing. Exercises will generate thinking and hone students' basic storytelling talents including characterization, exposition, plot, conflict, back-story, dialogue, and appropriate use of language. Students will learn how to use symbols to design a story and how to manipulate the symbols to create character, plot, message, and interactivity. Students will be encouraged to access their own genius, culture, and life experience in the development of their stories.

**ENG 410 Interactive Storytelling (3 Cr.)**

*Prerequisite(s): ENG 110*

In this class, students will learn to design stories with symbolic language. Exercises will help students apply and understand character design and development, archetypes, conflict, plot patterns, back-story, dialogue, exposition, premise, and the psychological dynamics of human choice. Students will also learn how to manipulate symbols in images by drawing from a variety of theoretical models, such as Carl Jung's dream analysis, personality profiling per Myers-Briggs, Gestalt psychology, and narrative architecture.

**ENG 420 Cybertexts: Interactive Media and the Future of Narrative (3 Cr.)**

*Prerequisite(s): ENG 110 or ENG 150, Equivalent, or Permission of instructor*

Video games and other forms of interactive media are widely touted as the future of both popular entertainment and narrative storytelling. If video games and other interactive media are developing into art forms, then we can expect that these emerging narrative forms will be able to accommodate genres of storytelling that have existed since time immemorial, including romance, comedy, tragedy, epic, and romance. Yet the dynamics of nonlinear storytelling, the limits of current video game technology, and the constraints of the marketplace do not seem conducive to expanding the narrative elements of interactive media. This course traces the boundaries between narratives and games, and aims to identify areas of overlap that can lead to the development of new expressions of narrativity in interactive media. One central goal of the course is to grapple with the problem(s) posed by interactive narrative.

Assigned readings examine the difference between traditional narrative texts and texts that require a higher degree of interactivity, collectively called cybertexts. The goal of the course is to identify what differences may exist, and to analyze the possibilities for adapting traditional narrative into interactive media. This class's central innovation requires students to actively adapt an element of traditional narrative into a cybertext. By the end of the class, students will have reached a conclusion, based on their reading and course work, as to whether cybertexts can effectively encompass traditional narrative genres, and if not, whether this is due to limitations of the form, or the limitations of technology.

**ENG 440 Advanced Fiction Writing (3 Cr.)**

*Prerequisite(s): ENG 245, ENG 315, or ENG 340*

This course builds upon the concepts and skills taught in previous writing courses. Advanced Fiction Writing offers students the opportunity to further develop their fiction-writing skills by engaging in intensive writing and regular critique of their peers' creative work. The emphasis is on refining narrative writing skills and developing individual style and voice. Students will write three full-length short stories and read contemporary fiction by established authors not discussed in previous courses. Enrollment will be limited to a maximum of twelve students. The limited class size will afford the intensive production schedule and frequent discussion of writing.

**ENG 450 Elements of Media and Game Development (2 Cr.)**

*Prerequisite(s): None*

Relative to modern technological media, the most important issue to consider is the nature of the interactive loop of influence between media and culture. Interactivity is one of the most powerful and important potentials of the game medium, but the term is often used with superficial understanding of its implications. This course emphasizes the nature of interactivity primarily from psychological and sociological perspectives. Students will review and define interactive media using examples drawn from academic research, film, television, and games. Students will have ample opportunity to contemplate and discuss how they can apply a more comprehensive understanding of interactivity in order to surpass the current limits of interactive media products.

## HISTORY

**HIS 100 Introduction to World History I (3 Cr.)**

*Prerequisite(s): None*

Covering a wide range of world history (Prehistoric to Middle Ages, Western and Asian Civilizations), this course provides an overview of events, civilizations, and cultures throughout time that form major historical shifts. Students will analyze a series of case studies with particular focus on governments, technology, religion, and culture, and how clashes between these (and other) themes created changes in culture, power, and civilizations. Three major themes connect several topics discussed in this course with those explored in HIS 150: issues of authority and inequality within civilizations; encounters and conflicts between civilizations; and cultural and technological exchanges within and between civilizations.

**HIS 150 Introduction to World History II (3 Cr.)**

*Prerequisite(s): HIS 100*

This course continues the topics covered in HIS 100, covering from approximately 1650 A.D. until present day (Renaissance to present day, Western and Asian Civilizations). Students will analyze a series of case studies with particular focus on governments, technology, religion, and culture, and how clashes between these (and other) themes created changes in culture, power, and civilizations. Three major themes connect several topics discussed in this course with those explored in HIS 100: issues of authority and inequality within civilizations; encounters and conflicts between civilizations; and cultural and technological exchanges within and between civilizations.

## JAPANESE

### JPN 101 Introduction to Japanese I (3 Cr.)

*Prerequisite(s): None*

This course is designed for students with little or no background in Japanese. The course presents the basics of pronunciation, orthography, speaking, listening comprehension, reading, writing, and the sociolinguistics of modern Japanese. This course emphasizes acquiring the ability to communicate and function accurately and appropriately in both speaking and writing Japanese.

### JPN 102 Japanese II (3 Cr.)

*Prerequisite(s): Equivalent or JPN 101*

This course is designed for students who have taken JPN 101 or an equivalent course. The pace of JPN 102 is slightly faster than JPN 101. JPN 102 emphasizes acquiring the ability to communicate and function in Japanese accurately and appropriately, both in speech and in writing. By the end of the course, students will be able to speak, understand, read, and write Japanese on a limited variety of topics.

## LAW

### LAW 115 Introduction to Intellectual Property and Contracts (3 Cr.)

*Prerequisite(s): None*

The animation and computer software industries are founded upon the principle of intellectual property. This course introduces students to the social concepts and traditions that led to the idea of intellectual property. It surveys the various international legal systems governing intellectual property, giving special consideration to Title 17 and the local statutes that govern copyrights, trademarks, and patents in the United States. Students will grapple with fundamental issues surrounding this field such as fair use, international relations, and economics. The course will also introduce students to a basic overview of contracts including structure, traditions, and vocabulary.

## MANAGEMENT

### MGT 450 Product Management (2 Cr.)

*Prerequisite(s): None*

This course provides an in-depth examination of theories and techniques in product management. Lectures will cover various aspects of product management including team leadership, interaction with management, marketing, budgeting, long-range project planning, and contract negotiations. The course will include exercises that will give students insight into dealing with team effectiveness and performance issues.

## PHILOSOPHY

### PHL 150 Introduction to Philosophy (3 Cr.)

*Prerequisite(s): ENG 110*

This course will introduce some of the basic philosophical issues and questions related to everyday life. Topics include human nature (self, mind, consciousness, and freedom), values (ethics, morality, and aesthetics), knowledge (reasoning, rationality, and truth), philosophy of science (universe and origins of life), philosophical positions (naturalism, idealism, realism, pragmatism, and existentialism), and philosophy of religion (god(s) and religion). Students will apply these concepts to the philosophical issues related to games and video games, specifically definitional issues, philosophical themes in games, and art in games, among others.

### PHL 399 Special Topics in Philosophy (3 Cr.)

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

## PSYCHOLOGY

### PSY 101 Introduction to Psychology (3 Cr.)

*Prerequisite(s): None*

This course introduces major topics in psychology, specifically as they relate to cognition and learning. These topics include perception, cognition, personality and social psychology, and biological aspects of behavior. Students will also be introduced to human information processing, memory, problem solving, attention, perception, and imagery. Other topics covered may include mental representation and transformation, language processing, and concept formation.

## SOCIAL SCIENCES

### SOS 115 Media and Ethics: A Social Science Perspective (3 Cr.)

*Prerequisite(s): None*

This course guides students in the ethical assessment of both the processes and outcomes of social decision-making. After an introduction to basic ethical theories, students will acquire an understanding of the structure of social institutions and the process through which one makes social choices. Central to the analysis is a study of ethics as a criterion for assessment of social decision-making with emphasis on the study of particular issues of social choice. The course also provides a theoretical framework within which to spot and analyze ethical issues in the media.

**SOS 150 Society and Technology (3 Cr.)**

*Prerequisite(s): None*

This course draws on techniques and perspectives from the social sciences, humanities, and cultural studies to explore technology and change in the modern era. In particular, students will examine how technology influences and is influenced by values and cultures in America and abroad. The course will help students recognize the range of consequences that technology in general, and information and communication technology (ICT) in particular, have when shaped and used by individuals, organizations, and society. Through readings, discussion, lectures, and written assignments, students will become acquainted with current controversies related to the socio-cultural dimensions of technology in the "digital era."

While the course examines the impact of technologies—including video gaming and robotics—on the contemporary world, it will also use an historical approach to address some of the technological innovations that have most affected U.S. society in the past. The course will consider how technologies are developed and sustained, and how they interact with and affect our urban culture. Specific themes likely to be addressed include technology's impact on the private and public spheres; the body and the self in cyberspace; and the criteria we use to determine a technology's success, failure, and danger.

**SOS 180 Race and Gender in Twenty-First Century America (3 Cr.)**

*Prerequisite(s): ENG 110*

This course takes a close look at current debates on race, gender, and ethnicity in American society. We will begin with an overview of definitions of race, gender, and ethnicity, exploring what they have meant in the past and what they mean now. We will then examine the intersections between race, gender, and ethnicity, asking the following questions: How do race and ethnicity differ, and how are they related? What difference does race make? How are race and gender related? where does sexual orientation fit into the discourse on gender, and how does it fit into discussions on race and ethnicity?

Current debates on race, gender, and ethnicity were highlighted by the 2008 election of the first African-American president and the ever-growing prominence of women in the highest levels of American politics. Does this mean that we have entered a post-racial era? Where exactly do we stand on women and gender-related issues? What about the place of GLBT issues in the public domain? This course explores these themes and topics.

**SOS 399 Special Topics in Social Sciences (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

# Department of Life Sciences

## BIOLOGY

**BIO 100 Visual Perception (3 Cr.)**

*Prerequisite(s): None*

This course explores the nature of human visual perception. Beginning with the physics of light and the anatomy of the human eye, the course examines how human beings process light information and use this data to survive. Additionally, students will examine neurophysiology, perceptual psychology, and artistic traditions. The course will give special consideration to the modern technological and professional uses of this knowledge.

**BIO 150 Human Muscular, Skeletal, and Kinetic Anatomy (3 Cr.)**

*Prerequisite(s): None*

This course explores the skeletal and muscular structures of the human body. Students will learn to identify skeletal and muscular forms from both live models and anatomical references. Additionally, students will consider terminology, structural arrangement, and kinetic function. The course will give special emphasis to adapting this knowledge to the needs of artists and animators.

**BIO 200 Animal Muscular, Skeletal, and Kinetic Anatomy (3 Cr.)**

*Prerequisite(s): BIO 150*

This course introduces the major skeletal and muscular structures of animals. Students will extrapolate their knowledge of the human form to the structure and form of a variety of animal types, specifically focusing upon the impact of locomotion and feeding strategies upon form. Additionally, students will consider terminology, structural arrangement, and kinetic function. The course also considers standard locomotion cycles and the relationship between humans and various animals. It will give special emphasis to adapting this knowledge to the needs of artists and animators.

**BIO 225 Animal Motion: Sequential Limb Movement (3 Cr.)**

*Prerequisite(s): None*

This course introduces the major locomotion cycles with the associated skeletal and muscular structures of animals in motion. Students will compare the moving bipedal, human-like form to the structure and form of a variety of animal types. Special emphasis will be placed on the impact of locomotion on form. Vocabulary, structural arrangement, and kinetic function will all be considered. The course also considers standard locomotion cycles of humans and various animals. Special emphasis will be given to adapting this knowledge to the needs of artists and animators.

**BIO 399 Special Topics in Biology (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

# Department of Mathematics

### MATHEMATICS

**MAT 100 Pre-Calculus with Linear Algebra and Geometry (4 Cr.)**

*Prerequisite(s): None*

This course presents a review of college algebra and trigonometry. The most basic part covers a review of functions and their graphs. This course emphasizes polynomial, rational, trigonometric, exponential and logarithmic functions as well as their inverses. Topics in trigonometry include analytic trigonometry and identities, the unit circle, and trigonometric functions of a real variable. Other topics include systems of equations and conic sections. Students may only earn credit for one of MAT 100 or MAT 140.

**MAT 140 Linear Algebra and Geometry (4 Cr.)**

*Prerequisite(s): None*

The two main themes throughout the course are vector geometry and linear transformations. Topics from vector geometry include vector arithmetic, dot product, cross product, and representations of lines and planes in three-space. Linear transformations covered include rotations, reflections, shears and projections. Students will study the matrix representations of linear transformations along with their derivations. The curriculum also presents Affine geometry and affine transformations along with connections to computer graphics. This course also includes a review of relevant algebra and trigonometry concepts. Students may only earn credit for one of MAT 100 or MAT 140.

**MAT 150 Calculus and Analytic Geometry I (4 Cr.)**

*Prerequisite(s): MAT 100 or MAT 140*

This course introduces the calculus of functions of a single real variable. The main topics include limits, differentiation, and integration. Limits include the graphical and intuitive computation of limits, algebraic properties of limits, and continuity of functions. Differentiation topics include techniques of differentiation, optimization, and applications to graphing. Integration includes Riemann sums, the definite integral, anti-derivatives, and the Fundamental Theorem of Calculus.

**MAT 180 Vector Calculus I (4 Cr.)**

*Prerequisite(s): MAT 140 & Prior calculus experience*

In this course, we extend the standard calculus of one-variable functions to multi-variable vector-valued functions. Vector calculus is used in many branches of physics, engineering, and science, with applications that include dynamics, fluid mechanics, electromagnetism, and the study of curves and surfaces. Topics covered include limits, continuity, and differentiability of functions of several variables, partial derivatives, extrema of multi-variable functions, vector fields, gradient, divergence, curl, Laplacian, and applications.

Credit may be received for this course or for MAT 150 but not for both.

**MAT 200 Calculus and Analytic Geometry II (4 Cr.)**

*Prerequisite(s): MAT 150 or MAT 180*

This course builds on the introduction to calculus in MAT 150. Topics in integration include applications of the integral in physics and geometry and techniques of integration. The course also covers sequences and series of real numbers, power series and Taylor series, and calculus of transcendental functions. Further topics may include a basic introduction to concepts in multivariable and vector calculus.

**MAT 225 Calculus and Analytic Geometry III (3 Cr.)**

*Prerequisite(s): MAT 200 or MAT 230*

This course extends the basic ideas of calculus to the context of functions of several variables and vector-valued functions. Topics include partial derivatives, tangent planes, and Lagrange multipliers. The study of curves in two- and three-space will focus on curvature, torsion, and the TNB-frame. Topics in vector analysis include multiple integrals, vector fields, Green's Theorem, the Divergence Theorem and Stokes' Theorem. Additionally, the course may cover the basics of differential equations.

**MAT 230 Vector Calculus II (4 Cr.)**

*Prerequisite(s): MAT 180*

This course is a continuation of MAT 180. Topics covered include differential operators on vector fields, multiple integrals, line integrals, general change of variable formulas, Jacobi matrix, surface integrals, and various applications. The course will also cover the theorems of Green, Gauss, and Stokes.

Credit may be received for this course or for MAT 200 but not both.

**MAT 250 Linear Algebra (3 Cr.)**

*Prerequisite(s): MAT 200 or MAT 230*

This course presents the mathematical foundations of linear algebra, which includes a review of basic matrix algebra and linear systems of equations as well as basics of linear transformations in Euclidean spaces, determinants, and the Gauss-Jordan Algorithm. The more substantial part of the course begins with abstract vector spaces and the study of linear independence and bases. Further topics may include orthogonality, change of basis, general theory of linear transformations, and eigenvalues and eigenvectors. Other topics may include applications to least-squares approximations and Fourier transforms, differential equations, and computer graphics.

**MAT 256 Introduction to Differential Equations (3 Cr.)**

*Prerequisite(s): MAT 200 or MAT 230*

This course introduces the basic theory and applications of first and second-order linear differential equations. The class will emphasize specific techniques such as the solutions to exact and separable equations, power series solutions, special functions and the Laplace transform. Applications include RLC circuits and elementary dynamical systems, and the physics of the second order harmonic oscillator equation.

**MAT 258 Discrete Mathematics (3 Cr.)**

*Prerequisite(s): MAT 200 or MAT 230*

This course gives an introduction to several mathematical topics of foundational importance in the mathematical and computer sciences. Typically starting with propositional and first order logic, the course considers applications to methods of mathematical proof and reasoning. Further topics include basic set theory, number theory, enumeration, recurrence relations, mathematical induction, generating functions, and basic probability. Other topics may include graph theory, asymptotic analysis, and finite automata.

**MAT 290 Linear Algebra and Geometry of Curves (3 Cr.)**

*Prerequisite(s): MAT 200 or MAT 230*

This course combines material from MAT 250 and MAT 300 into a single course. Topics from linear algebra include vector spaces, linear transformations, change of basis, function spaces, and piecewise polynomials. Topics from geometry include Bezier curves, splines, interpolation, and constructive curves and surfaces. Students may not earn credit for MAT 290 if they also earned credit for either MAT 250 or MAT 300.

**MAT 300/500 Curves and Surfaces (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

This course is an introduction to parametrized polynomial curves and surfaces with a view toward applications in computer graphics. It will discuss both the algebraic and constructive aspects of these topics. Algebraic aspects include vector spaces of functions, special polynomial and piecewise polynomial bases, polynomial interpolation, and polar forms. Constructive aspects include the de Casteljau algorithm and the de Boor algorithm. Other topics may include an introduction to parametric surfaces and multivariate splines.

**MAT 340 Probability and Statistics (3 Cr.)**

*Prerequisite(s): MAT 200 or MAT 230, & MAT 258*

This course is an introduction to basic probability and statistics with an eye toward computer science and artificial intelligence. Basic topics from probability theory include sample spaces, random variables, continuous and discrete probability density functions, mean and variance, expectation, and conditional probability. Basic topics from statistics include binomial, Poisson, chi-square, and normal distributions; confidence intervals; and the Central Limit Theorem. Further topics may include fuzzy sets and fuzzy logic.

**MAT 350/550 Advanced Curves and Surfaces (3 Cr.)**

*Prerequisite(s): MAT 300/500*

This course is a continuation of MAT 300 with topics taken from the theory and applications of curves and surfaces. The class will treat some of the material from MAT 300 in more detail, like the mathematical foundations for non-uniform rational B-spline (NURBS) curves and surfaces, knot insertion, and subdivision. Other topics may include basic differential geometry of curves and surfaces, tensor product surfaces, and multivariate splines.

**MAT 351/551 Quaternions, Interpolation, and Animation (3 Cr.)**

*Prerequisite(s): MAT 300/500*

This course gives an introduction to several mathematical topics of foundational importance to abstract algebra, and in particular the algebra of quaternions. Topics covered may include: operations, groups, rings, fields, vector spaces, algebras, complex numbers, quaternions, curves over the quaternionic space, interpolation techniques, splines, octonions, and Clifford algebras.

**MAT 352/552 Wavelets (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

This course presents the foundations of wavelets as a method of representing and approximating functions. It will discuss background material in complex linear algebra and Fourier analysis. Basic material on the discrete and continuous wavelet transforms forms the core subject matter. This includes the Haar transform, and multi-resolution analysis. Other topics may include subdivision curves and surfaces, and B-spline wavelets. Applications to computer graphics may include image editing, compression, surface reconstruction from contours, and fast methods of solving 3D simulation problems.

**MAT 353/553 Differential Geometry (3 Cr.)**

*Prerequisite(s): MAT 300/500*

This course presents an introduction to differential geometry, with emphasis on curves and surfaces in three-space. It will include background material on the differentiability of multivariable functions. Topics covered include parametrized curves and surfaces in three-space and their associated first and second fundamental forms, Gaussian curvature, the Gauss map, and an introduction to the intrinsic geometry of surfaces. Other topics may include an introduction to differentiable manifolds, Riemannian geometry, and the curvature tensor.

**MAT 354/554 Discrete and Computational Geometry (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

Topics covered in this course include convex hulls, triangulations, Art Gallery theorems, Voronoi diagrams, Delaunay graphs, Minkowski sums, path finding, arrangements, duality, and possibly randomized algorithms, time permitting. Throughout the course, students will explore various data structures and algorithms. We will discuss the analysis of these algorithms, focusing specifically on the mathematics that arises in their development and analysis. CS 330 is recommended background.

**MAT 355/555 Graph Theory (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

This course provides an introduction to the basic theorems and algorithms of graph theory. Topics include graph isomorphism, connectedness, Euler tours, Hamiltonian cycles, and matrix representation. Further topics may include spanning trees, coloring algorithms, planarity algorithms, and search algorithms. Applications may include network flows, graphical enumeration, and embedding of graphs in surfaces.

**MAT 356/556 Advanced Differential Equations (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 256*

This course covers the advanced theory and applications of ordinary differential equations. The first course in differential equations focused on basic prototypes such as exact and separable equations and the second-degree harmonic oscillator equation. This course builds upon these ideas with a greater degree of generality and theory. Topics include qualitative theory, dynamical systems, calculus of variations, and applications to classical mechanics. Further topics may include chaotic systems and cellular automata. With this overview, students will be prepared to study the specific applications of differential equations to the modeling of problems in physics, engineering, and computer science.

**MAT 357/557 Numerical Analysis (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

This course covers the numerical techniques arising in many areas of computer science and applied mathematics. Such techniques provide essential tools for obtaining approximate solutions to non-linear equations arising from the construction of mathematical models of real-world phenomena. Topics of study include root finding, interpolation, approximation of functions, cubic splines, integration, and differential equations. Further topics may include stability, iterative methods for solving systems of equations, eigenvalue approximation, and the fast Fourier transform.

**MAT 359/559 Computational Algebraic Geometry (3 Cr.)**

*Prerequisite(s): MAT 300/500*

This course introduces computational algebra as a tool to study the geometry of curves and surfaces in affine and projective space. The central objects of study are affine varieties and polynomial ideals, and the algebra-geometry dictionary captures relations between these two objects. The precise methods of studying polynomial ideals make use of monomial orderings, Grobner bases, and the Buchberger algorithm. Students will have opportunities to program parts of these algorithms and to use software packages to illustrate key concepts. Further topics may include resultants, Zariski closure of algebraic sets, intersections of curves and surfaces, and multivariate polynomial splines.

**MAT 361/561 Introduction to Number Theory and Cryptography (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

This course is an introduction to elementary number theory and cryptography. Among the essential tools of number theory that will be covered are divisibility and congruence, Euler's function, Fermat's little theorem, Euler's formula, the Chinese remainder theorem, powers modulo m, kth roots modulo m, primitive roots and indices, and quadratic reciprocity. These tools will then be used in cryptography, where we will discuss e.g. encryption schemes, the role of prime numbers, security and factorization, the DES algorithm, public key encryption, and various other topics, as time allows.

**MAT 362/562 Fuzzy Sets and Logic (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

This course introduces the basic theory of fuzzy sets and fuzzy logic and explores some of their applications. Topics covered include classical sets and their operations, fuzzy sets and their operations, membership functions, fuzzy relations, fuzzification/defuzzification, classical logic, multi-valued logic, fuzzy logic, fuzzy reasoning, fuzzy arithmetic, classical groups, and fuzz groups. Students will also explore a number of applications, including approximate reasoning, fuzzy control, fuzzy behavior, and interaction in computer games.

**MAT 364/564 Combinatorial Game Theory (3 Cr.)**

*Prerequisite(s): MAT 258*

Combinatorial Game Theory studies finite, two-player games in which there are no ties. Techniques from logic, combinatorics, and set theory are used to prove various properties of such games. Typical games include Domineering, Hackenbush, and Nim. The analysis of such games can also be used to study other more complex games like Dots and Boxes, and even Go. Topics covered in this course include Conway's theory of numbers as games, impartial and partizan games, winning strategies, outcome classes, and algebra of games.

**MAT 365/565 Introduction to Topology (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

This course introduces topology and its applications. Topics covered include topological spaces, quotient and product spaces, metric and normed spaces, connectedness, compactness, and separation axioms. Further topics may include basic algebraic topology, fixed point theorems, theory of knots, and applications to kinematics, game theory, and computer graphics.

**MAT 399/599 Special Topics in Mathematics (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

**MAT 400 Introductory Analysis I (3 Cr.)**

*Prerequisite(s): MAT 250*

This course will introduce the foundations of real analysis by means of a rigorous reexamination of the topics covered in elementary calculus. The course starts with the topology of the real line and proceeds to a formal examination of limits, continuity, and differentiability. The course will also cover the convergence of sequences and series of real numbers and the uniform convergence of sequences of real valued functions.

**MAT 410 Introductory Analysis II (3 Cr.)**

*Prerequisite(s): MAT 400*

A continuation of MAT 400, this course emphasizes the formal treatment of the theory of integration of functions of a real variable. It reexamines the Riemann integral and the Fundamental theorem of calculus as well as the theory of the Stieltjes and Lebesgue integral and their applications in probability and Fourier analysis. The course concludes with a discussion of the topology of R^n, and the differentiability and integrability of functions of several variables, including the theorems of Green and Stokes and the divergence theorem.

**MAT 450 Abstract Algebra I (3 Cr.)**

*Prerequisite(s): MAT 250 & MAT 258*

This course provides an introduction to the foundations of abstract algebra. The fundamental objects of study are groups, rings, and fields. The student will build on previous courses in algebra, particularly linear algebra, with an even greater emphasis here on proofs. The study of groups is an ideal starting point, with few axioms but a rich landscape of examples and theorems, including matrix groups, homomorphism theorems, group actions, symmetry, and quotient groups. This course will extend these ideas to the study of rings and fields. Topics in ring theory include polynomial rings and ideals in rings. The course will also cover fields, their construction from rings, finite fields, basic theory of equations, and Galois theory.

**MAT 460 Abstract Algebra II (3 Cr.)**

*Prerequisite(s): MAT 400*

This course builds on the foundations established in MAT 450. It will extend the fundamental objects of groups, rings, and fields to include modules over rings and algebras. The course will give the basic ideas of linear algebra a more rigorous treatment and extend scalars to elements in a commutative ring. In this context, students will study the general theory of vector spaces and similarity of transformations. The curriculum will also discuss non-commutative algebras and rings, emphasizing examples such as quaternion algebras. Further topics may include non-associative rings and algebras, Galois theory, exact sequences, and homology.

# Department of Physics

## PHYSICS

**PHY 115 Introduction to Applied Math and Physics (3 Cr.)**

*Prerequisite(s): None*

We live in a world governed by physical laws. As a result we have become accustomed to objects' motions being in accordance with these laws. This course examines the basic physics and mathematics governing natural phenomena such as light, weight, inertia, friction, momentum, and thrust as a practical introduction to applied math and physics. Students will explore geometry, trigonometry for cyclical motions, and physical equations of motion for bodies moving under the influence of forces. With these tools, students will develop a broader understanding of the impact of mathematics and physics on their daily lives.

**PHY 200 Motion Dynamics (3 Cr.)**

*Prerequisite(s): None*

*Concurrent Course(s): MAT 200 or MAT 230*

This calculus-based course presents the fundamental principles of mechanics for simulation and engineering majors. Students will learn the laws that govern the mechanical world and how to use these laws to form a simulated world. They will examine the concepts involved with kinematics, Newtonian dynamics, work and energy, momentum, rotational motion, and statics.

**PHY 200L Motion Dynamics Laboratory (1 Cr.)**

*Prerequisite(s): None*

*Concurrent Course(s): PHY 200*

This course presents the concepts of PHY 200 in the laboratory. The experiments allow the student to experience the laws of basic physics involving linear motion, force, gravitation, conservation of energy, conservation of momentum, collisions, rotational motion, and springs. Error analysis and data reduction techniques are taught and required in experimental reports.

**PHY 250 Waves, Optics, and Aerodynamics (3 Cr.)**

*Prerequisite(s): PHY 200*

This calculus-based course provides a fundamental understanding of fluid dynamics, oscillations and waves, optics, and thermodynamics. By understanding the physical laws governing these phenomena, students will be able to implement ray casting and ray tracing algorithms, as well as create realistic flight simulators, lens effects, and many-body simulations.

**PHY 250L Waves, Optics, and Thermodynamics Laboratory (1 Cr.)**

*Prerequisite(s): None*

*Concurrent Course(s): PHY 250*

This course presents the concepts of PHY 250 in the laboratory. The experiments allow the student to experience the physical laws involving oscillations, waves, sound, interference, lift, drag, heat, optics, and entropy. Extended error analysis and statistics are taught and required in experimental reports.

**PHY 270 Electricity and Magnetism (3 Cr.)**

*Prerequisite(s): PHY 200*

This calculus-based course studies the basic concepts underlying electrical and magnetic phenomena. It considers the following topics: atoms and free electrons; Coulomb's law; the electric field, Gauss's Law, and potential; capacitance, properties of dielectrics, current, resistance, and EMF; DC circuits and instruments, and Kirchhoff's rules; the magnetic field and magnetic forces on current-carrying conductors; magnetic field of a current; electromagnetic induction and magnetic properties of matter; alternating current; Maxwell's equations; electromagnetic waves; semiconductors and the PN junction; and photoelectric effect.

**PHY 270L Electricity and Magnetism Laboratory (1 Cr.)**

*Prerequisite(s): None*

*Concurrent Course(s): PHY 270*

This course presents the concepts of PHY 270 in the laboratory. The experiments allow the student to experience the physical laws involving electric fields, electric potential, electric current, electric charge, capacitance, current, resistance, inductance, circuits, and magnetism. Error analysis and statistics are taught and required in experimental reports.

**PHY 290 Modern Physics (3 Cr.)**

*Prerequisite(s): MAT 200 or MAT 230, PHY 200, & PHY 250 or PHY 270*

The wake of modern physics has given rise to massive technological advancements that have changed our daily lives. This course covers many of the modern issues within the field and emphasizes the problem-solving nature of physics. The class is a calculus based scientific examination of topics from general relativity and quantum mechanics through nuclear physics, high-energy physics, and astrophysics.

**PHY 290L Modern Physics Laboratory (1 Cr.)**

*Prerequisite(s): None*

*Concurrent Course(s): PHY 290*

This course presents the concepts of PHY 290 in the laboratory. The experiments allow the student to experience the discoveries of the last 100 years. The Michelson-Morley interferometer, the photoelectric effect, the electron's charge to mass ratio, the Franck-Hertz experiments, electron diffraction and the thermal band-gap. Error analysis and statistics are taught and required in experimental reports.

**PHY 300 Advanced Mechanics (3 Cr.)**

*Prerequisite(s): CS 200, CS 250, MAT 150 or MAT 180, MAT 200 or MAT 230, MAT 250, PHY 200, & PHY 250*

This course covers the physics behind more complex mechanical interactions as well as the numerical techniques required to approximate the systems for simulations. A thorough analysis of mechanical systems through energy analysis will provide the basis for the understanding of linear and rotational systems. The combination of theoretical physics and numerical methods will provide students with the background for simulating physical systems with limited computational power. Topics covered include Lagrangian Dynamics, Hamilton's Equations, dynamics of rigid bodies, motion in non-inertial reference frames, the use of the inertia tensor, collision resolution, and numerical techniques including methods of approximation.

**PHY 350 Physics Simulation (3 Cr.)**

*Prerequisite(s): MAT 300/500 & PHY 300*

In this course, students will gather into teams of two to three and create a physics engine with minimal interface and graphics. Weekly lectures will go over the implementation of concepts covered in PHY 300 as well as collision resolution, objects on surfaces, holonomic and non-holonomic constraints, numerical approximations, and special topics that address project-specific physics.

**PHY 399 Special Topics in Physics (3 Cr.)**

*Prerequisite(s): Permission of instructor*

The content of this course will change each time it is offered. It is for the purpose of offering a new or specialized course of interest to the faculty and students that is not covered by the courses in the current catalog.

**PHY 500 Advanced Physically-Based Modeling (3 Cr.)**

*Prerequisite(s): Entrance into the Master of Science in Computer Science program*

This class covers the topics in dynamics modeling techniques, including methods in the calculus of variations, Hamilton's principle, Lagrangian dynamics, Hamiltonian dynamics, motion in a non-inertial reference frame, dynamics of rigid bodies (moments of inertia, inertia tensor, and stability), collision resolution (impact parameters, scattering, and restitution), and physics of continuous bodies (elasticity, deformation, stress, and strain).

**PHY 550 Physics Simulation (3 Cr.)**

*Prerequisite(s): Entrance into the Master of Science in Computer Science program*

Students will gather into teams of two to three and create a physics engine with minimal interface and graphics. Weekly lectures will detail the implementation of concepts covered in PHY 300, as well as collision resolution, objects on surfaces, holonomic and non-holonomic constraints, and numerical approximations. Additionally, students will study special topics that address project-specific physics.

# Faculty

**Academic Leadership**

| | |
|---|---|
| Dean of Faculty & Academic Affairs | Xin Li |
| Associate Dean | Charles Duba |
| Associate Dean | Jen Sward |
| Registrar | Meighan Shoesmith |
| Program Director - Bachelor of Arts in Game Design | Jen Sward |
| Program Director (Acting) - Bachelor of Fine Arts in Production Animation | Raymond Yan |
| Program Director - Bachelor of Science in Computer Engineering | Charles Duba |
| Program Director - Bachelor of Science in Game Design | Jen Sward |
| Program Director - Bachelor of Science in Real-Time Interactive Simulation | Samir Abou Samra |
| Program Director - Master of Science in Computer Science | Xin Li |
| Internship Coordinator - R.T.I.S. & Games | Jen Sward |
| Internship Coordinator - Art | Tony White |

**Department of Computer Science**

| | | |
|---|---|---|
| Samir Abou Samra* | B.S. Computer Science<br>M.S. Computer Science | Lebanese American University<br>Lebanese American University |
| Antoine Abi Chakra | B.S. Computer Science<br>M.S. Computer Science | DigiPen Institute of Technology, Lebanon<br>DigiPen Institute of Technology |
| Claude Comair | Le diplôme d'Ingenieur Archit.<br>M. Engineering Environmental Engineering | L'Université du Saint Esprit (Lebanon)<br>Osaka University (Japan) |
| Christopher Comair | B.S. Real-Time Interactive Simulation | DigiPen Institute of Technology |
| Sun Tjen Fam | B.S. Computer Science<br>Diploma | University of British Columbia (Canada)<br>DigiPen Applied Computer Graphics, Vancouver (Canada) |
| Jason Hanson | B.S. Mathematics<br>B.S. Physics<br>M.S. Physics<br>M.A. Mathematics<br>Ph.D. Mathematics | University of Massachusetts<br>University of Massachusetts<br>University of Virginia<br>Columbia University<br>University of Hawaii |
| Gary Herron | B.A. Mathematics<br>Ph.D. Mathematics | Northern Michigan University<br>University of Utah |
| Xin Li | B.S. Computer Science<br>M.S. Computer Science<br>Ph.D. Computer Science | Northwest University (P.R. of China)<br>Academic Sinica (P.R. of China)<br>University of Central Florida |
| Matthew Mead | B.S. Computer Science<br>M.S. Computer Science | Portland State University<br>Portland State University |

| | | |
|---|---|---|
| Ken Meerdink | B.S. Mathematics and Computer Science<br>M.S. Mathematics<br>Ph.D. Mathematics<br>M.S. Software Engineering | University of Iowa<br>University of Iowa<br>University of Idaho<br>Seattle University |
| Patrick Moghames | B.S. Computer Science<br>M.S. Computer Science | DigiPen Institute of Technology, Lebanon<br>DigiPen Institute of Technology |
| Steve Rabin | B.S. Computer Engineering<br>M.S. Computer Science | University of Washington<br>University of Washington |
| Jeff Tucker | B.S. Computing and Software Systems | University of Washington |
| Dmitri Volper | B.S. Mathematical and Computer Science<br>M.S. Mathematics<br>M.S. Computer and Information Science<br>Ph.D. Mathematical Sciences | Omsk State University (Russia)<br>Syracuse University<br>Syracuse University<br>Russian Academy of Sciences, Novosibirsk (Russia) |
| Hao Wu | B.S. Electrical Engineering<br>M.S. Electrical Engineering | Tsinghua University (P.R. of China)<br>University of Washington |

**Department of Electrical and Computer Engineering**

| | | |
|---|---|---|
| Charles Duba* | B.S. Physics<br>M.S. Physics<br>Ph.D. Physics | University of California, San Diego<br>University of Washington<br>University of Washington |
| Chris Allen | B.S. Electrical Engineering<br>M.S. Electrical Engineering<br>Ph.D. Electrical Engineering | Manhattan College<br>New York University<br>University of Washington |
| Francis Wang | B.S. Electrical Engineering<br>M.S. Electrical Engineering<br>Ph.D. Electrical Engineering | Washington State University<br>Washington State University<br>University of Minnesota |

**Department of Fine Arts and Animation**

| | | |
|---|---|---|
| Robert Kmiec* | B.F.A. Illustration<br>M.F.A. Illustration | Massachusetts College of Art<br>Syracuse University |
| Donald "BJ" Becker | B.A. 3D Design<br>M.A. Illustration | West Surrey College of Arts and Design (England)<br>Syracuse University |
| Dan Daly | B.A. English | Whitman College |
| Billy Jarcho | B.F.A. Visual Design in Media Arts | Emerson College |
| Jim Johnson | B.A. Theater Arts<br>M.A. Cinematography | Humboldt State University<br>Humboldt State University |
| Suzanne Kaufman | B.A. Computer Animation and Photography | University of Wisconsin, Madison |
| Geraldine Kovats | B.F.A. Illustration | Academy of Art, San Francisco |
| Chun Lu | B.S. Interior Architecture<br>M.A. Design Communication | University of Missouri, Columbia<br>University of Missouri, Columbia |
| Michelle Lu | B.S. Horticulture<br>Certificate of Recommendation in 3D Computer Graphics Animation and 3D Design | National Chung-Hsing University (Taiwan)<br>Vancouver Film School/DigiPen Applied Computer Graphics School |

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|---|---|---|
| Peter Moehrle | Associate of the Ontario College of Art | Ontario College of Art (Canada) |
| Alecia Rossano | B.A. Studio Art<br>M.F.A. Sculpture | Scripps College<br>New York Academy of Art |
| Lawrence Schwedler | B.A. Music<br>M.F.A. Music Performance | University of California, Los Angeles<br>University of California, Los Angeles |
| Alain Schneuwley | Diploma, Computer Analyst and Programmer<br>Federal Diploma of Commerce<br>Certificate of Recommendation in 3D Computer Graphics Animation and 3D Design | IEPIGE (Switzerland)<br>Superior Commercial School (Switzerland)<br>Vancouver Film School/DigiPen Applied Computer Graphics School |
| Tony White | Graphic Design, Typography, & Illustration | East Ham Technical College (England) |
| Charles Wood | B.A. Biology<br>B.S. Medical Illustration Science<br>M.S. Medical Illustration<br>Ph.D. Physical Anthropology | Kalamazoo College<br>The Medical College of Georgia<br>The Medical College of Georgia<br>University of Washington |

**Department of Game Software Design and Production**

| | | |
|---|---|---|
| Benjamin Ellinger * | B.S. Kinesiology | University of Texas |
| Jay Gale | B.A. Broadcast Communication | University of Colorado |
| Michael Moore | B.A. Communication Arts<br>B.A. English<br>M.A. Communication Arts | St. Mary's College<br>St. Mary's College<br>Southern Illinois University |
| Chris Peters | B.S. Real-Time Interactive Simulation | DigiPen Institute of Technology |
| Mike Pondsmith | B.A. Design<br>B.S. Psychology | University of California, Davis |
| Brett Roark | B.S. Mathematics<br>M.S. Computer Science | Louisiana State University<br>University of California, Santa Barbara |
| Rachel Rutherford | B.A. Rhetoric | University of California, Berkeley |
| Douglas Schilling | B.S. Computer Science | Pacific Lutheran University |
| Jen Sward | B.S. Electrical & Computer Engineering | University of California, Davis |

**Department of Humanities and Social Sciences**

| | | |
|---|---|---|
| Claire Joly* | B.A. English Language & Literature<br>M.A. American Studies<br>M.A. Theatre & African American Studies<br>Ph.D. Comparative Cultures | Sorbonne (France)<br>Sorbonne (France)<br>Smith College<br>University of California, Irvine |
| Anna Maria Hong | B.A. Philosophy<br>M.F.A. Creative Writing | Yale University<br>University of Texas, Austin |
| Fara Nizamani | B.S. Ed. Secondary English Education<br>M.A. English Literature<br>Ph.D. English Literature | University of Miami<br>Barry University<br>City University of Los Angeles |
| Stephen Schafer | B.A. Psychology<br>M.A. English | University of Denver<br>University of Denver |

**Department of Life Sciences**

| | | |
|---|---|---|
| Charles Wood* | B.A. Biology<br>B.S. Medical Illustration Science<br>M.S. Medical Illustration<br>Ph.D. Physical Anthropology | Kalamazoo College<br>The Medical College of Georgia<br>The Medical College of Georgia<br>University of Washington |

**Department of Mathematics**

| | | |
|---|---|---|
| Matthew Klassen* | B.S. Mathematics<br>Ph.D. Mathematics | University of Arizona<br>University of Arizona |
| Michael Aristidou | B.S. Mathematics<br>M.S. Mathematics<br>M.A. Philosophy<br>Ph.D. Mathematics | Aristotle University of Thessaloniki (Greece)<br>Louisiana State University<br>Louisiana State University<br>Louisiana State University |
| Antonie Boerkoel | B.S. Mathematics<br>M.S. Mathematics<br>Ph.D. Mathematics | University of Leiden (Netherlands)<br>University of Leiden (Netherlands)<br>University of Texas |
| Andy Demetre | B.S. Mathematics<br>M.S. Mathematics | Reed College<br>University of Washington |
| Martin Weinless | B.S. Physics<br>Ph.D. Mathematics | City College of New York<br>Polytechnic University |

**Department of Physics**

| | | |
|---|---|---|
| Erik Mohrmann * | B.S. Physics<br>M.S. Physics<br>Ph.D. Physics | Rensselaer Polytechnic Institute<br>University of Washington<br>University of Washington |
| Adam Cox-Mobrand | B.S. Physics<br>M.S. Physics<br>Ph.D. Physics | Arizona State University<br>Arizona State University<br>University of Washington |
| Charles Duba | B.S. Physics<br>M.S. Physics<br>Ph.D. Physics | University of California, San Diego<br>University of Washington<br>University of Washington |

* Department Chair

# Staff

**Management**

| | |
|---|---|
| President and Chief Executive Officer | Claude Comair |
| Chief Operating Officer, International | Jason Chu |
| Chief Financial Officer | John Bauer |
| Chief Operating Officer, U.S.A. | Raymond Yan |
| Chief Technology Officer | Samir Abou Samra |
| Executive Vice President of Asia-Pacific | Prasanna Ghali |
| Senior Vice President of Administration | Meighan Shoesmith |
| Senior Vice President of Compliance | Melvin Gonsalvez |

**Accounting**

| | |
|---|---|
| Controller | Mayu Davis |
| Director of Administration/Bursar | Yuki Taber |
| Accounting Assistant | Hiroko Honda |
| Accounting Assistant | Carol Jacobs |

**Admissions**

| | |
|---|---|
| Director of Admissions | Angela Kugler |
| Admissions Representative and Outreach Coordinator | Elise DeGoede |
| Admissions Outreach and Marketing Coordinator | Sean Harris |
| Admissions Coordinator | Amy Vasquez |
| Admissions Administrative Assistant | Betsey Walker |

**Financial Aid**

| | |
|---|---|
| Director of Financial Aid | Kim King |
| Financial Aid Administrator | Marti Jackson |
| Financial Aid Administrator | Jerome Ward |

**Student Affairs**

| | |
|---|---|
| Director of Student Affairs/Director of Learning Resource Center | Gordon Dutrisac |
| Student Affairs Coordinator/International Students Coordinator | Kati Von Lehman |
| Student Affairs Coordinator - Student Involvement | Hanako Lombardi |
| Librarian/Career Services Coordinator | Karen Wheeler |
| Assistant Registrar | Asuka Miyahara |
| Counselor/Disability Support Services Coordinator | Kay Widmer |

**ProjectFUN Outreach Program**

| | |
|---|---|
| Director of K-12 Outreach | Martin Culbert |
| Outreach Coordinator | Heidi Munoz |

**Administration**

| | |
|---|---|
| Art Department Administrative Coordinator | Angela Baker |
| Executive Assistant | Myrna Meneem |
| Receptionist | Suzanne Tremblay |

**I.T.**

| | |
|---|---|
| Director of I.T. | Atom Powers |
| I.T. Support | Ryan Fulcher |
| I.T. Support | David Kuehn |
| Web Services Administrator | Aaron Klemm |
| Web Support | Jason Alexander |

**Media Production**

| | |
|---|---|
| Director of Production | Raymond Yan |
| Assistant Producer | Linnéa Mobrand |
| Production Artist | Katrina Chu |

**Facilities**

| | |
|---|---|
| Director of Facilities and Security | Joel Smith |
| Facilities Support | Rosa Ocampo |

# NOTES

# NOTES