



# COURSE CATALOG ADDENDUM

**2015-2016**  
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# Calendars

[Updated: June 2015]

[Additional dates announced: Spring Break, Commencement, Orientation.]

## ACADEMIC CALENDAR

- **August 25-27, 2015**  
*Tuesday-Thursday*  
Orientation
- **August 31, 2015**  
*Monday*  
Classes Begin – Fall Semester
- **September 7, 2015**  
*Monday*  
Labor Day  
*No Classes – Labs Closed*
- **November 11, 2015**  
*Wednesday*  
Veterans Day  
*No Classes – Labs Open*
- **November 26-27, 2015**  
*Thursday-Friday*  
Thanksgiving  
*No Classes – Labs Closed*
- **December 7-11, 2015**  
*Monday-Friday*  
Fall Semester Final Exams
- **December 11, 2015**  
*Friday*  
Fall Semester Ends
- **December 12-January 3, 2016**  
*Saturday-Sunday*  
Winter Break  
*No Classes – Labs Closed*
- **January 4, 2016**  
*Monday*  
Classes Begin – Spring Semester
- **January 18, 2016**  
*Monday*  
M.L. King Jr. Day  
*No Classes – Labs Closed*
- **February 3, 2016**  
*Wednesday*  
Founder's Day  
*No Classes – Labs Open*
- **February 15, 2016**  
*Monday*  
Presidents' Day  
*No Classes – Labs Open*
- **March 14-18, 2016**  
*Monday-Friday*  
Spring Break  
*No Classes – Labs Open*
- **April 18-22, 2016**  
*Monday-Friday*  
Spring Semester Final Exams
- **April 22, 2016**  
*Friday*  
Spring Semester Ends
- **April 23-May 1, 2016**  
*Saturday-Sunday*  
Intersession  
*No Classes – Labs Closed*
- **April 23, 2016**  
*Saturday*  
Commencement
- **May 2, 2016**  
*Monday*  
Classes Begin – Summer Session
- **May 30, 2016**  
*Monday*  
Memorial Day  
*No Classes – Labs Closed*
- **July 4, 2016**  
*Monday*  
Independence Day  
*No Classes – Labs Closed*
- **July 18-22, 2016**  
*Monday-Friday*  
Summer Session Final Exams
- **July 22, 2016**  
*Friday*  
Summer Session Ends
- **August 30-September 1, 2016**  
*Sunday-Tuesday*  
Orientation – Incoming Students
- **September 5, 2016**  
*Monday*  
Labor Day  
*No Classes – Labs Closed*
- **September 6, 2016**  
*Tuesday*  
Classes Begin – Fall Semester
- **November 11, 2016**  
*Friday*  
Veterans Day  
*No Classes – Labs Open*
- **November 24-25, 2016**  
*Thursday-Friday*  
Thanksgiving  
*No Classes – Labs Closed*
- **December 12-16, 2016**  
*Monday-Friday*  
Fall Semester Final Exams
- **December 16, 2016**  
*Friday*  
Fall Semester Ends

The Institute is closed on all statutory holidays. Exam periods and breaks may be subject to change. The laboratory facilities may be closed for a period of two consecutive days per month for maintenance. It is usually the last two working days of the month unless otherwise posted. Enrollment occurs once a year, in September.

## DEADLINES

- **July 7, 2015**  
*Tuesday*  
Last day to submit a Request for Change of Major for Fall 2015 semester. Last day to submit an Application for Readmission for Fall 2015 semester.
- **August 1, 2015**  
*Saturday*  
Tuition balance due for Fall 2015 semester.
- **September 6, 2015**  
*Sunday*  
Last day to drop Fall 2015 semester courses for 100% refund. Last day to add courses for Fall 2015 semester.
- **September 13, 2015**  
*Sunday*  
Final day to drop courses without academic penalty.
- **September 29, 2015**  
*Tuesday*  
Withdrawal deadline for 50% refund.
- **October 25, 2015**  
*Sunday*  
Final day to receive a “W” on transcript for Fall 2015 semester withdrawals. Withdrawals from the Institute after this date will receive an “F” (or 0 quality points) on transcript. Final day to drop courses.
- **November 25, 2015**  
*Wednesday*  
Last day to submit a Request for Change of Major for Spring 2016 semester. Last day to submit an Application for Readmission for Spring 2016 semester.
- **December 1, 2015**  
*Tuesday*  
Tuition balance due for Spring 2016.
- **January 10, 2016**  
*Sunday*  
Last day to drop Spring 2016 semester courses for 100% refund. Last day to add courses for Spring 2016 semester.
- **January 17, 2016**  
*Sunday*  
Final day to drop courses without academic penalty.
- **February 2, 2016**  
*Tuesday*  
Withdrawal deadline for 50% refund.
- **February 28, 2016**  
*Sunday*  
Final day to receive a “W” on transcript for Spring 2016 semester withdrawals. Withdrawals from the Institute after this date will receive an “F” (or 0 quality points) on transcript. Final day to drop a course.
- **April 1, 2016**  
*Friday*  
Tuition balance due for Summer 2016 session.
- **April 7, 2016**  
*Thursday*  
Last day to submit a Request for Change of Major for Summer 2016 session. Last day to submit an Application for Readmission for Summer 2016 session.
- **May 8, 2016**  
*Sunday*  
Last day to drop Summer 2016 session courses for 100% refund. Last day to add courses for Summer 2016 session. Automatic withdrawal date from courses missing prerequisites.
- **May 15, 2016**  
*Sunday*  
Final day to drop courses without academic penalty.
- **May 31, 2016**  
*Tuesday*  
Last day to receive 50% Summer 2016 session tuition refund.
- **June 26, 2016**  
*Sunday*  
Final day to receive a “W” on transcript for Summer 2016 session withdrawals. Withdrawals from the Institute after this date will receive an “F” (or 0 quality points) on transcript. Final day to drop a course.
- **July 7, 2016**  
*Thursday*  
Last day to submit a Request for Change of Major for Fall 2016 semester. Last day to submit an Application for Readmission for Fall 2016 semester.
- **August 1, 2016**  
*Monday*  
Tuition balance due for Fall 2016 semester.
- **September 12, 2016**  
*Monday*  
Last day to drop Fall 2016 semester courses for 100% refund. Last day to add courses for Fall 2016 semester.
- **September 19, 2016**  
*Monday*  
Final day to drop courses without academic penalty.
- **October 5, 2016**  
*Wednesday*  
Withdrawal deadline for 50% refund.
- **October 31, 2016**  
*Monday*  
Final day to receive a “W” on transcript for Fall 2016 semester withdrawals. Withdrawals from the Institute after this date will receive an “F” (or 0 quality points) on transcript. Final day to drop a course.
- **November 23, 2016**  
*Wednesday*  
Last day to submit a Request for Change of Major for Spring 2017 semester. Last day to submit an Application for Readmission for Spring 2017 semester.
- **December 1, 2016**  
*Thursday*  
Tuition balance due for Spring 2017.

# General Policies

## INSTITUTIONAL MISSION

*[Updated: March 2015]*

*[Revision of content.]*

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

## Tuition and Fees

*[Updated: June 2015]*

*[Removal of Parking Fee. Revision of the administrative fee and the technology fee.]*

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

### ADMINISTRATIVE FEE

This fee covers a limited number of transcript requests, add/drop requests, and enrollment verifications. This fee is \$50.00 per semester for all students.

### TECHNOLOGY FEE

This fee covers paper and toner for the student-use printers and maintenance costs associated with the upkeep of the equipment. This fee is \$50.00 per semester for all students.

## Cancellation and Refund Policies 2015-2016

*[Updated: August 2015]*

*[Revision of cancellation policies and the application of policy.]*

### CANCELLATION POLICIES

- 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 following a tour of the school facilities and inspection of equipment where training and services are provided.
- All monies paid by an applicant who cancels must 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 (i.e., prior to attending classes on or after the start date as noted on the enrollment agreement), is entitled to a refund of all monies paid minus an enrollment fee of \$150.

## APPLICATION OF POLICY

Any monies due to the student shall be refunded within 60 days of the account's change of status (i.e., the date when the Registrar changes the status of a student's account) 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.

DigiPen's Institutional Refund Policy operates independently from the Return of Title IV Funds Policy required for Title IV federal student aid recipients.

## Financial Assistance

*[Updated: June 2015]*

*[Revision of section 6 of the Return of Title IV Funds Policy. Addition of the Veterans Affairs Catalog Certification Statement to the Financial Aid Code of Conduct.]*

### RETURN OF TITLE IV FUNDS POLICY

DigiPen's Institutional Refund Policy operates independently from the Return of Title IV Funds Policy requirements for all financial aid recipients.

#### I. TREATMENT OF TITLE IV FUNDS

When a recipient of a Title IV grant and/or loan withdraws from the Institute during any payment period in which the recipient began attendance, the Institute must determine the amount of Title IV grant and/or loan that the recipient earned as of the student's withdrawal date. Unearned funds must be returned to the Title IV programs.

#### II. THE RETURN OF TITLE IV FUNDS

This policy applies to all financial aid recipients who withdraw, drop out, leave without notice, or otherwise fail to complete 60% of the payment period for which they received Title IV funds (grants and/or loans).

1. The term "Title IV Funds" refers to the Federal Financial Aid programs authorized under the Higher Education Act of 1965 (as amended) and includes the following programs administered by the Institute: Direct Subsidized and Unsubsidized Stafford Loans, Direct PLUS loans for Parents and Graduates, Pell Grants and Federal Supplementary Education Opportunity Grant (FSEOG), Federal Work Study, and the Iraq and Afghanistan Service Grant (IASG).
2. A student's withdrawal date is the last date of attendance as determined by the Institute's attendance records or the date of determination in accordance with the Institute's withdrawal policy.

3. The calculation required determines a student's earned and unearned Title IV aid based on the percentage of the payment period completed by the student. The Institute calculates the amount of Title IV assistance earned by the student by dividing the number of days the student attended in the payment period by the number of days in the payment period. Calendar days (including weekends) are used, but breaks of at least 5 days are excluded from both the numerator and denominator.
4. Until a student has passed the 60% point of a payment period, only a portion of the student's aid has been earned. A student who remains enrolled beyond the 60% point is considered to have earned all awarded aid for the payment period.
5. In accordance with Federal Regulations refunds are allocated in the following order:
  - » Federal Direct Unsubsidized Federal Stafford loans
  - » Federal Direct Subsidized Federal Stafford loans
  - » Federal Direct PLUS loans
  - » Federal Direct Grad PLUS loans
  - » Federal Work Study
  - » Federal Pell Grant
  - » Federal Supplemental Educational Opportunity Grant (FSEOG)
  - » Iraq and Afghanistan Service Grant (IASG)
6. Institutional and student responsibility in regard to the return of Title IV Funds:
  - The responsibility to repay unearned Title IV aid is shared by the Institute and the student. For example, the calculation may require the Institute to return a portion of the federal funds to the Title IV programs.
  - The Institute will return the funds within 45 calendar days of the date the Institute determined the student withdrew. The Institute will return the loan funds and make adjustments to as required by Federal Regulations. The Bursar will refund the funds to the Direct Loan Program or a subsequent holder, if the loan has been transferred and the school knows the new holder's identity.
  - In addition, the student may also be obligated to return funds based on the calculation. A student returns funds to the Direct Stafford loan programs based on the terms and conditions of the promissory note of the loan. A student who receives a Federal Grant may be required to repay 50% of the funds received.

Financial Aid. In addition, the Office of Financial Aid makes readily available the written refund requirements.

- Identifying students who are affected by this policy and completing the Return of Title IV funds calculation for those students.
- Returning any Title IV funds that are due to the Title IV programs.

#### STUDENT'S RESPONSIBILITY

The student's responsibilities in regard to the return of Title IV Funds include:

- Returning to the Title IV programs any funds that were disbursed directly to the student and which the student was determined to be ineligible for via the Return of Title IV Funds calculation.
  - Students who owe funds to a grant program are required to make payment of those funds within 45 days of being notified that they owe this overpayment. During the 45-day period students will stay eligible for Title IV funds. If the student does not take any action within the 45 days of being notified, the Institute will notify the U.S. Department of Education of the student's overpayment situation. The student will no longer be eligible for Title IV funds until they enter into a satisfactory repayment agreement with the U.S. Department of Education.
7. Post-Withdrawal Disbursement: If a student receives less federal student aid than the amount earned, the Institute must offer a post-withdrawal disbursement. The Institute is required to make a post-withdrawal disbursement within 180 days of the date the Institute determines the student withdrew. Upon completion of the Return of Title IV Funds calculation, if it is determined a post withdrawal is due to the student and/or parent, the Institute will notify the student and/or parent in writing.
  8. The Institute will make readily available a summary of the Return of Title IV Funds requirements to any enrolled and/or prospective student by request to the Office of Financial Aid.

### **III. TO OFFICIALLY WITHDRAW FROM DIGIPEN INSTITUTE OF TECHNOLOGY**

Please refer to the *Withdrawing from the Institute* section.

### **IV. CANCELLATION AND REFUND POLICIES**

Please refer to the *Cancellation and Refund Policies* section.

If students have any questions or concerns regarding the Return of Title IV Funds Policy, Refund Policy, Overpayment, or would like examples of the Return of Title IV Funds calculations, please contact the Office of Financial Aid.

#### THE INSTITUTE'S RESPONSIBILITY

The Institute's responsibilities in regard to the return of Title IV funds include:

- Making this policy readily available by request to any enrolled and/or prospective student through the Office of

## DIGIPEN'S FINANCIAL AID CODE OF CONDUCT

In response to the enactment of the Higher Education Opportunity Act in August of 2008, DigiPen's Office of Financial Aid has adopted the following NASFAA (National Association of Student Financial Aid Administrators) Code of Conduct to help ensure ethical behavior and the highest level of professional practices. All DigiPen staff members responsible for the administration of federal and private educational loans are subject to these guidelines.

### **NASFAA STATEMENT OF ETHICAL PRINCIPLES**

The primary goal of the financial aid professional is to help students achieve their educational goals through financial support and resources. NASFAA members are required to exemplify the highest level of ethical behavior and demonstrate the highest level of professionalism. The following guidelines were last updated by NASFAA's Board of Directors in March 2014.

We, financial aid professionals, declare our commitment to the following Statement of Ethical Principles.

Financial aid administrators shall:

#### ADVOCATE FOR STUDENTS

Remain aware of issues affecting students and continually advocate for their interests at the institutional, state and federal levels.

Support federal, state and institutional efforts to encourage students, as early as the elementary grades, to aspire to and plan for education beyond high school.

#### MANIFEST THE HIGHEST LEVEL OF INTEGRITY

Commit to the highest level of ethical behavior and refrain from conflict of interest or the perception thereof.

Deal with others honestly and fairly, abiding by our commitments and always acting in a manner that merits the trust and confidence others have placed in us.

Protect the privacy of individual student financial records.

Promote the free expression of ideas and opinions, and foster respect for diverse viewpoints within the profession.

#### SUPPORT STUDENT ACCESS AND SUCCESS

Commit to removing financial barriers for those who want to pursue postsecondary learning and support each student admitted to our institution.

Without charge, assist students in applying for financial aid funds.

Provide services and apply principles that do not discriminate on the basis of race, gender, ethnicity, sexual orientation, religion, disability, age, or economic status.

Understand the need for financial education and commit to educate students and families on how to responsibly manage expenses and debt.

#### COMPLY WITH FEDERAL AND STATE LAWS

Adhere to all applicable laws and regulations governing federal, state, and institutional financial aid programs.

Actively participate in ongoing professional development and continuing education programs to ensure ample understanding of statutes, regulations, and best practices governing the financial aid programs.

Encourage colleagues to participate in the financial aid professional associations available to them at the state, regional, or national level and offer assistance to other aid professionals as needed.

#### STRIVE FOR TRANSPARENCY AND CLARITY

Provide our students and parents with the information they need to make good decisions about attending and paying for college.

Educate students and families through quality information that is consumer-tested when possible. This includes (but is not limited to) transparency and full disclosure on award notices.

Ensure equity by applying all need-analysis formulas consistently across the institution's full population of student financial aid applicants.

Inform institutions, students, and parents of any changes in financial aid programs that could affect their student aid eligibility.

#### PROTECT THE PRIVACY OF FINANCIAL AID APPLICANTS

Ensure that student and parent private information provided to the financial aid office by financial aid applicants is protected in accordance with all state and federal statutes and regulations, including FERPA and the Higher Education Act, Section 483(a)(3) (E) (20 U.S.C. 1090).

Protect the information on the FAFSA from inappropriate use by ensuring that this information is only used for the application, award, and administration of aid awarded under Title IV of the Higher Education Act, state aid, or aid awarded by eligible institutions.

### **NASFAA CODE OF CONDUCT FOR INSTITUTIONAL FINANCIAL AID PROFESSIONALS**

The following Code of Conduct was last updated by NASFAA's Board of Directors in March 2014. Institutional members of NASFAA will ensure that:

1. No action will be taken by financial aid staff that is for their personal benefit or could be perceived to be a conflict of interest.



- a. Employees within the financial aid office will not award aid to themselves or their immediate family members. Staff will reserve this task to an institutionally designated person, to avoid the appearance of a conflict of interest.
  - b. If a preferred lender list is provided, it will be compiled without prejudice and for the sole benefit of the students attending the institution. The information included about lenders and loan terms will be transparent, complete, and accurate. The complete process through which preferred lenders are selected will be fully and publically disclosed. Borrowers will not be auto-assigned to any particular lender.
  - c. A borrower's choice of a lender will not be denied, impeded, or unnecessarily delayed by the institution, even if that lender is not included on the institution's preferred lender list.
  - d. No amount of cash, gift, or benefit in excess of a de minimis amount shall be accepted by a financial aid staff member from any financial aid applicant (or his/her family), or from any entity doing business with or seeking to do business with the Institute (including service on advisory committees or boards beyond reimbursement for reasonable expenses directly associated with such service).
2. Information provided by the Office of Financial Aid is accurate, unbiased, and does not reflect preference arising from actual or potential personal gain.
  3. Institutional award notifications and/or other institutionally provided materials shall include the following:
    - a. breakdown of individual components of the institution's Cost of Attendance, designating all potential billable charges.
    - b. Clear identification of each award, indicating type of aid, i.e. gift aid (grant, scholarship), work, or loan.
    - c. Standard terminology and definitions, using NASFAA's glossary of award letter terms.
    - d. Renewal requirements for each award.
  4. All required consumer information is displayed in a prominent location on the institutional web site(s) and in any printed materials, easily identified and found, and labeled as "Consumer Information."
  5. Financial aid professionals will disclose to their institution any involvement, interest in, or potential conflict of interest with any entity with which the institution has a business relationship.

DigiPen Institute of Technology does not and will not provide any commission, bonus, or other incentive payment based directly or indirectly on success in securing enrollment or financial aid to any persons or entities engaged in any student recruiting or admissions activities or in making decisions regarding the award of student financial assistance.

## DRUG CONVICTIONS AND FINANCIAL AID ELIGIBILITY

A federal or state drug conviction can disqualify a student for Federal Student Aid funds. Convictions count against a student for an offense that occurred during a period of enrollment for which the student was receiving Federal Student Aid. Drug or other convictions can also disqualify students for DigiPen institutional scholarships and grants.

Please refer to the *Policies and Consumer Information* section at: [digipen.edu/financial-aid](http://digipen.edu/financial-aid).

## Waiver Credit, Advanced Placement Examinations, CLEP

[Updated: June 2015]

[Please note that the *International Baccalaureate* section published in the first edition of the 2015-2016 Course Catalog for DigiPen Institute of Technology is now deprecated information.]

[Addition of AP Physics – Electricity and Magnetism to the Accepted AP Scores chart.]

## Advanced Placement Examinations

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

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

## ACCEPTED AP SCORES AND DIGIPEN COURSE EQUIVALENTS

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

## Student Internships

[Updated: June 2015]

[Revision of content.]

### OVERVIEW OF INTERSHIPS

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

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

### GENERAL INFORMATION REGARDING INTERSHIP PROGRAMS

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

- Academic learning—applying knowledge learned in the classroom to tasks in the workplace.
- Career development—gaining knowledge necessary to meet minimum qualifications for a position in the student's field of interest.
- Skill development—an understanding of the skills and knowledge required in a specific job category.

- Personal development—gaining decision-making skills, critical thinking skills, and increased confidence and self-esteem.

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

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

## Change of Major and Graduation

[Updated: June 2015]

[Addition of Graduating with Academic Honors section.]

### GRADUATING WITH ACADEMIC HONORS

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

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

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

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

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

## Student Affairs

[Updated: June 2015]

[Addition of Counseling Services section.]

### COUNSELING SERVICES

DigiPen Counseling Center provides resources to students dealing with a variety of personal issues, from short-term individual counseling to crisis intervention. All services offered by the DigiPen Counseling Center are overseen by a Washington state-licensed mental health counselor and are completely free to DigiPen students. To schedule an appointment, please contact Counseling Center staff by calling (425) 629-5015.

# Regulation of Conduct and Disciplinary Procedures

[Updated: June 2015]

[Updated policies regulating student conduct to include the Code of Student Conduct, the Academic Dishonesty policy, and the policies pertaining to disciplinary procedures, appeals, and dismissal following student misconduct.]

DigiPen Institute of Technology is an academic institution that strives to ensure all students have a safe and effective learning environment free of harassment, which supports collaborative and cooperative education. To this end, students will comport themselves in a professional manner when dealing with instructors, faculty, administrators, and/or other students. They are expected to dress and manage personal hygiene in a way that does not cause undue offense to other students, faculty, or staff of the Institute, and to refrain from verbal or physical intimidation of others. 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.

## CODE OF STUDENT CONDUCT

The Code of Student Conduct is to embody the mission and the core values of DigiPen Institute of Technology through actions and behaviors, and adhere to campus policies and procedures.

This Code applies to all undergraduate students, all graduate students, and all students participating in academic or professional programs on campus. The Code generally applies to conduct that occurs on DigiPen's campus or at DigiPen-related events and activities. Behavior conducted off-campus may also result in disciplinary action against students when, in the judgment of DigiPen's administration, the conduct is considered in violation of the Code. The Code requires students to cooperate with a reasonable request by DigiPen staff or faculty members (or emergency response or law enforcement personnel) acting in good faith and within the scope of their duties, including but not limited to, failure to cease the prohibited conduct, failure to produce identification, or interference with or failure to cooperate with an investigation by DigiPen.

Students are responsible for being informed about DigiPen Institute of Technology's Code of Student Conduct. DigiPen reserves the right without prior notice to change the rules, policies, or information in the Code of Student Conduct. New policies will be enforced 24 hours after notification of the change to students through email.

DigiPen Institute of Technology adheres to the belief that students learn and develop by taking responsibility for their actions. The disciplinary process is designed to help students understand how to succeed and recognize their impact as a part of a larger community. These skills are vital to becoming a

professional leader in any industry. The Chief Operating Officer (or designee) and Student Affairs administration, acting on behalf of DigiPen Institute of Technology, determine whether or not an incident warrants disciplinary action. For further information regarding rules, regulations, policies governing student actions, the disciplinary process, and appeals process, please refer to the DigiPen Institute of Technology Student Handbook. The Student Handbook can be found online or a copy can be retrieved from the Office of Student Affairs.

## ACADEMIC DISHONESTY

Plagiarism will not be tolerated. Any student who submits the work of another person as the student's own is considered to have committed plagiarism. Types of work that should not 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, the student should consult an instructor for clarification.

Students shall not submit any work to the Institute that infringes upon the intellectual property rights of a third party. If, during the program, a student submits such work to the Institute, the student shall indemnify or hold harmless the Institute from and against all loss, damage, cost (including legal fees), and other liability, which the Institute may suffer as a result of the same.

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.

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.

## DISCIPLINARY PROCESS

1. Student Affairs is notified of the alleged student misconduct.
2. Student Affairs will gather information to determine if the allegations are warranted, what, if any, policies were violated, and the extent of the violations.
3. Student Affairs will assess the need for a disciplinary hearing.
  - a. One offense of academic dishonesty may or may not result in a disciplinary hearing, however two notifications of academic dishonesty will automatically result in a hearing with the Appeals and Disciplinary Committee.

4. The student(s) involved will be contacted through email, phone, or letter indicating the alleged violation and a meeting time with Student Affairs.
5. Based on the severity of the alleged violation, a Student Affairs Officer will determine during the meeting if the student will have the disciplinary meeting with:
  - a. Student Affairs Officer(s) (if the alleged violation does not have the possibility of resulting in suspension or expulsion), or
  - b. Appeals and Disciplinary Committee (if the alleged violation does have the possibility of resulting in suspension or expulsion).
    - » The Appeals and Disciplinary Committee consists of faculty, staff, and students who are briefed on the alleged violation and review relevant information to the alleged misconduct.
6. If the student is not found to be in violation of any academic or campus policy, there will be no further action.
7. If the student is found to be in violation of any academic or campus policy, Student Affairs or the Appeals and Disciplinary Committee will determine the appropriate sanction, which can include, but is not limited to, community service, a failing grade, suspension, or expulsion from DigiPen.
8. The student will be notified in writing of the decision and of any possible sanctions.
9. Student Affairs will monitor any sanction imposed on the student.
10. Students who fail to comply with the terms of their sanction will be committing an additional policy violation and could be subject to further disciplinary action.
11. All documentation of the violation will be kept on file with the Dean of Students.

## 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.

## 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. Expulsion from the Institute.
7. Legal action against the student committing the offense.

## APPEALING A CHARGE OF ACADEMIC DISHONESTY OR POLICY VIOLATION

A student has the right to appeal a charge of academic dishonesty or policy violation, or the penalties assigned for academic dishonesty or policy violation, with the Appeals and Disciplinary Committee. The student has two weeks from the official written charge to appeal the alleged violation.

## APPEALING A DECISION MADE BY THE APPEALS AND DISCIPLINARY COMMITTEE

The student has the right to dispute the decision of the Appeals and Disciplinary Committee. If the student wishes to make an appeal, the student must notify the Dean of Faculty (or designee) and must provide a full explanation of the reasons for appealing in writing within one week of being notified of the decision. Appeal hearings take place before the Dean of Faculty (or designee). A member of the Appeals and Disciplinary Committee puts forth the reason for the original decision. As soon as possible after the hearing is completed, the Dean of Faculty (or designee) will notify the student of the final decision in writing.

The student has the right to dispute the disciplinary decision of the Dean of Faculty (or designee) for all decisions resulting in suspension or expulsion. If the student wishes to make an appeal, the student must notify the Chief Operating Officer – International in writing within one week of being notified of the decision, and must provide a full explanation of the reasons for appealing. The Dean of Faculty (or designee) puts forth the reasons for the original decision. As soon as possible after the hearing is completed, the Chief Operating Officer – International will notify the student of the final decision in writing.

## DISMISSAL BY THE INSTITUTE

By written notice to a student, the Institute may, at its sole discretion, dismiss a student at any time if the student 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 the student is unable to maintain the

minimum required GPA in the student's courses at the end of each semester. Upon dismissal, the student shall immediately return to the Institute all materials in the student's possession relating to the program, whether created by the student or other students, or provided by the Institute. In the event of dismissal, tuition and fees, if any, shall be refunded in accordance with the refund schedule, as it may be amended from time to time.

## Family Educational Rights and Privacy Act (FERPA)

[Updated: June 2015]

[Update of content as provided by the U.S. Department of Education.]

### STUDENTS' RIGHTS TO THEIR ACADEMIC RECORDS

The Family Educational Rights and Privacy Act (FERPA) affords eligible students certain rights with respect to their education records. (An "eligible student" under FERPA is a student who is 18 years of age or older or who attends a postsecondary institution at any age.) These rights include:

1. The right to inspect and review the student's education records within 45 days after the day the Institute receives a request for access. A student should submit to the Registrar, Dean, or head of the academic department, a written request that identifies the record(s) the student wishes 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, misleading, or otherwise in violation of the student's privacy rights under FERPA.
  - » A student who wishes to ask the school to amend a record should write the school official responsible for the record, clearly identify the part of the record the student wants changed, and specify why it should be changed.
  - » If the Institute decides not to amend the record as requested, the Institute will notify the student in writing of the decision and the student's 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 provide written consent before the Institute discloses personally identifiable information (PII) from the

student's education records, except to the extent that FERPA authorizes disclosure without consent.

The Institute discloses education records without a student's prior written consent under the FERPA exception for disclosure to school officials with legitimate educational interests. A school official typically includes a person employed by the Institute in an administrative, supervisory, academic, research, or support staff position (including law enforcement unit personnel and health staff); a person serving on the Board of Trustees; or a student serving on an official committee, such as a disciplinary or grievance committee. A school official also may include a volunteer or contractor outside of the Institute who performs an institutional service of function for which the school would otherwise use its own employees and who is under the direct control of the school with respect to the use and maintenance of PII from education records, such as an attorney, auditor, or collection agent or a student volunteering to assist another school official in performing his or her tasks. A school official typically has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibilities for the Institute.

4. The right to file a complaint with the U.S. Department of Education concerning alleged failures by the Institute to comply 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, SW  
Washington, DC 20202

FERPA permits the disclosure of PII from students' education records, without consent of the student, if the disclosure meets certain conditions found in § 99.31 of the FERPA regulations. Except for disclosures to school officials, disclosures related to some judicial orders or lawfully issued subpoenas, disclosures of directory information, and disclosures to the student, § 99.32 of FERPA regulations requires the institution to record the disclosure. Eligible students have a right to inspect and review the record of disclosures. A postsecondary institution may disclose PII from the education records without obtaining prior written consent of the student —

- To other school officials, including teachers, within DigiPen whom the school has determined to have legitimate educational interests. This includes contractors, consultants, volunteers, or other parties to whom the school has outsourced institutional services or functions, provided that the conditions listed in § 99.31(a)(1)(i)(B)(1) - (a)(1)(i)(B)(3) are met. (§ 99.31(a)(1))
- To officials of another school where the student seeks or intends to enroll, or where the student is already enrolled if the disclosure is for purposes related to the student's

enrollment or transfer, subject to the requirements of § 99.34. (§ 99.31(a)(2))

- To authorized representatives of the U. S. Comptroller General, the U.S. Attorney General, the U.S. Secretary of Education, or State and local educational authorities, such as a State postsecondary authority that is responsible for supervising the university's State-supported education programs. Disclosures under this provision may be made, subject to the requirements of §99.35, in connection with an audit or evaluation of Federal- or State-supported education programs, or for the enforcement of or compliance with Federal legal requirements that relate to those programs. These entities may make further disclosures of PII to outside entities that are designated by them as their authorized representatives to conduct any audit, evaluation, or enforcement or compliance activity on their behalf. (§§ 99.31(a)(3) and 99.35)
- In connection with financial aid for which the student has applied or which the student has received, if the information is necessary to determine eligibility for the aid, determine the amount of the aid, determine the conditions of the aid, or enforce the terms and conditions of the aid. (§ 99.31(a)(4))
- To organizations conducting studies for, or on behalf of, the school, in order to: (a) develop, validate, or administer predictive tests; (b) administer student aid programs; or (c) improve instruction. (§ 99.31(a)(6))
- To accrediting organizations to carry out their accrediting functions. (§ 99.31(a)(7))
- To parents of an eligible student if the student is a dependent for IRS tax purposes. (§ 99.31(a)(8))
- To comply with a judicial order or lawfully issued subpoena. (§ 99.31(a)(9))
- To appropriate officials in connection with a health or safety emergency, subject to § 99.36. (§ 99.31(a)(10))
- Information the school has designated as "directory information" under § 99.37. (§ 99.31(a)(11))
- To a victim of an alleged perpetrator of a crime of violence or a non-forcible sex offense, subject to the requirements of § 99.39. The disclosure may only include the final results of the disciplinary proceeding with respect to that alleged crime or offense, regardless of the finding. (§ 99.31(a)(13))
- To the general public, the final results of a disciplinary proceeding, subject to the requirements of § 99.39, if the school determines the student is an alleged perpetrator of a crime of violence or non-forcible sex offense and the student has committed a violation of the school's rules or policies with respect to the allegation made against him or her. (§ 99.31(a)(14))
- To parents of a student regarding the student's violation of any Federal, State, or local law, or of any rule or policy of the school, governing the use or possession of alcohol or a controlled substance if the school determines the student committed a disciplinary violation and the student is under the age of 21. (§99.31(a)(15))

## DECLINING 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, the student may restrict access through SRS. No information will be released on students or to students who have restricted release of directory information, including degrees awarded and dates of attendance.

## ALLOWING RELEASE OF INFORMATION

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

# Degree Programs for the Academic Year 2015-2016



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

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

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

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

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

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

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

Students in the BS in Computer Science in Real-Time Interactive Simulation program who are interested in pursuing a graduate degree at DigiPen or taking graduate level coursework during their undergraduate studies may participate in the "BS/MS in Computer Science Accelerated Schedule" option, which permits students to obtain the Bachelor of Science and Master of Science (both in Computer Science) degrees within five years. Students who meet the minimum requirements to take selected graduate-level courses during the junior and senior years of their undergraduate study can apply up to 15 credits towards both BS and MS degree requirements. Students who pursue the accelerated schedule can successfully complete their BS in Computer Science in Real-Time Interactive Simulation degree and Master of Science in Computer Science in five years



sequentially. Please refer to the BS/MS in Computer Science Accelerated Schedule section for more details. This degree program provides an intensive education in a specialized and highly complex scientific area, and it prepares students for a career in several rapidly expanding industries.

For details about graduation rates, median debt for students who complete this program, and other important information visit [digipen.edu/fileadmin/disclosures/RTIS.html](http://digipen.edu/fileadmin/disclosures/RTIS.html).

## Degree Requirements

### NUMBER OF CREDITS AND GPA

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

### GRADE REQUIREMENTS AND CORE COURSES

Students must receive a grade of “C-” (or 1.7 quality points) or higher in all core courses for the BS in Computer Science and Real-Time Interactive Simulation major. (In a non-core course, a grade of “D” [or 1.0 quality points] or higher is considered passing.) The core courses are all those taken to fulfill the GAM, MAT, and CS requirements. PHY 200 is also a core course.

### ART AND MUSIC

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

### COMPUTER SCIENCE

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

### HUMANITIES AND SOCIAL SCIENCES

The following courses are required: COL 101, ENG 110, and COM 150. Five additional ENG credits are required from ENG 116 and above. Students must take an additional three credits in HIS, PSY, or SOS. (Total: 15 credits)

### MATHEMATICS

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

### PHYSICS

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

### PROJECTS

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

### OPEN ELECTIVES

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

### NOTE ON GENERAL EDUCATION COURSES

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

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

| SEMESTER          | COURSE                | COURSE TITLE  | CORE* | CREDITS |
|-------------------|-----------------------|---|-------|---------|
| <b>Semester 1</b> | MAT 140               | Linear Algebra and Geometry                             | X     | 4       |
|                   | CS 100                | Computer Environment                                    | X     | 3       |
|                   | CS 100L               | Computer Environment Lab                                | X     | 1       |
|                   | CS 120                | High-level Programming I: The C Programming Language    | X     | 4       |
|                   | GAM 100               | Project Introduction                                    | X     | 3       |
|                   | ENG 110               | Composition   |       | 3       |
|                   | COL 101               | College Life and Academic Skills                        |       | 1       |
|                   | <b>Semester Total</b> |   |       |         |
| <b>Semester 2</b> | MAT 150 or<br>MAT 180 | Calculus and Analytic Geometry I or Vector Calculus I   | X     | 4       |
|                   | CS 170                | High-level Programming II: The C++ Programming Language | X     | 4       |
|                   | CS 230                | Game Implementation Techniques                          | X     | 3       |
|                   | GAM 150               | Project I   | X     | 3       |
|                   | COM 150               | Interpersonal and Work Communication                    |       | 3       |
|                   | <b>Semester Total</b> |   |       |         |
| <b>Semester 3</b> | MAT 200 or<br>MAT 230 | Calculus and Analytic Geometry II or Vector Calculus II | X     | 4       |
|                   | CS 180                | Operating System I: Man-Machine Interface               | X     | 3       |
|                   | CS 200                | Computer Graphics I                                     | X     | 3       |
|                   | CS 225                | Advanced C/C++  | X     | 3       |
|                   | GAM 200               | Project II  | X     | 4       |
|                   | PHY 200               | Motion Dynamics   | X     | 3       |
|                   | <b>Semester Total</b> |   |       |         |
| <b>Semester 4</b> | PHY 250               | Waves, Optics, and Aerodynamics                         |       | 3       |
|                   | CS 250                | Computer Graphics II                                    | X     | 3       |
|                   | CS 365                | Software Engineering                                    | X     | 3       |
|                   | CS 280                | Data Structures   | X     | 3       |
|                   | GAM 250               | Project II  | X     | 4       |
|                   | MAT 250               | Linear Algebra  | X     | 3       |
|                   | <b>Semester Total</b> |   |       |         |
| <b>Semester 5</b> | CS 300                | Advanced Computer Graphics I                            | X     | 3       |
|                   | CS 260                | Computer Networks I: Interprocess Communication         | X     | 3       |
|                   | CS 330                | Algorithm Analysis                                      | X     | 3       |
|                   | MAT 258               | Discrete Mathematics                                    | X     | 3       |
|                   | CG 130                | 3D Computer Animation Production I                      |       | 3       |
|                   | GAM 300               | Project III   | X     | 5       |
|                   | <b>Semester Total</b> |   |       |         |

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

| SEMESTER            | COURSE                               | COURSE TITLE   | CORE* | CREDITS            |
|---------------------|--------------------------------------|--|-------|--------------------|
| <b>Semester 6</b>   | MAT 300                              | Curves and Surfaces  | X     | 3                  |
|                     | CS 350                               | Advanced Computer Graphics II  | X     | 3                  |
|                     | CS 315                               | Low-level Programming  | X     | 3                  |
|                     | Computer Science Elective            | Any 200-level or higher CS course not required   | X     | 3                  |
|                     | GAM 350                              | Project III  | X     | 5                  |
|                     | Open Elective                        | An elective of the student's choice from any department at DigiPen                     |       | 3                  |
|                     | <b>Semester Total</b>                |  |       |                    |
| <b>Semester 7</b>   | ART and MUS Elective                 | Select one: ANI 125, ART 105, FLM 115, FLM 151, FLM 152, or MUS 115                    |       | 3                  |
|                     | English Elective                     | One English elective chosen from any ENG course, ENG 116 and above                     |       | 3                  |
|                     | Computer Science Elective            | Any 200-level or higher CS course not required   | X     | 3                  |
|                     | Math Elective                        | MAT 256 or any MAT course greater than 300   | X     | 3                  |
|                     | GAM 375                              | Project III  | X     | 5                  |
|                     | Open Elective                        | An elective of the student's choice from any department at DigiPen                     |       | 3                  |
|                     | <b>Semester Total</b>                |  |       |                    |
| <b>Semester 8</b>   | English Elective                     | One English elective chosen from any ENG course, ENG 116 and above                     |       | 2                  |
|                     | Computer Science Elective            | Any 200-level or higher CS course not required   | X     | 3                  |
|                     | Computer Science or Physics Elective | Any 200-level or higher CS course not required   | X     | 3                  |
|                     | GAM 450                              | Project IV   | X     | 5                  |
|                     | Open Elective                        | An elective of the student's choice from any department at DigiPen                     |       | 3                  |
|                     | HSS Elective                         | One humanities & social science elective from any three-credit HIS, PSY or SOS courses |       | 3                  |
|                     | <b>Semester Total</b>                |  |       |                    |
| <b>Degree Total</b> |                                      |  |       | <b>154 minimum</b> |

# Accelerated Schedule: BS/MS in Computer Science

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

## Eligibility

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

- be enrolled in Bachelor of Science in Computer Science in Real-Time Interactive Simulation degree program at DigiPen Institute of Technology
- have Junior standing
- have a GPA in CS/MAT/PHY courses of 3.00 or higher
- submit petition to take graduate-level CS electives to MSCS Program Director

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

## Policies

The recommended course sequence for the Bachelor of Science in Computer Science in Real-Time Interactive Simulation degree program includes several electives. Students on the accelerated schedule may choose up to five graduate level CS, PHY, or MAT courses for their corresponding electives. Those courses will be shared between undergraduate and graduate programs. No more than two of the shared courses can be non-CS electives. Students may only share credits of courses for which they earn a B- or higher. Shared courses must satisfy requirements of the Master of Science in Computer Science Program.

# Degree Requirements

The MS in Computer Science degree program requires a total of 37 credits; students who complete 15 credits during their undergraduate program will have 22 credits remaining. Those remaining credits may be completed in two semesters (i.e., 12 credits during the first semester and 10 during the second). Students taking the accelerated schedule must also satisfy the MS in Computer Science program graduation requirements by completing the following:

- One of the remaining courses must be a MAT course numbered 500 or higher.
- GAM 550 and GAM 551 are required.
- Students must take CS 598 (MS in Computer Science Colloquium).
- A sequence of 2 graduate-level courses in an approved concentration area. Graduate-level courses taken during the undergraduate program may be used to fulfill this requirement.
- Either one of the following:
  - » Thesis or
  - » Extra coursework and Comprehensive Exam.

## Accelerated Schedule: MS

### Recommended Course Sequence

Below is the recommended MS in Computer Science schedule for students completing the accelerated schedule.

| SEMESTER   | OPTIONS                | COURSE NAME  | CREDITS |
|------------|------------------------|--|---------|
| Semester 1 | MAT Elective           | MAT 500 or above   | 3       |
|            | Concentration Elective | See MS in Computer Science Degree Requirements section for details | 3       |
|            | GAM 550                | Advanced Game Project  | 3       |
|            | Elective or CS 601     | CS 500 or above or Master's Thesis I                               | 3       |
| Semester 2 | CS 598                 | CS Colloquium  | 1       |
|            | Concentration Elective | See MS in Computer Science Degree Requirements section for details | 3       |
|            | GAM 551                | Advanced Game Project  | 3       |
|            | Elective or CS 602     | CS 500 or above or Master's Thesis II                              | 3       |

# Bachelor of Science in Computer Science and Game Design

## Program Overview

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

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

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

For details about graduation rates, median debt for students who complete this program, and other important information visit [digipen.edu/fileadmin/disclosures/BSGD.html](http://digipen.edu/fileadmin/disclosures/BSGD.html).

## Degree Requirements

### NUMBER OF CREDITS & GPA

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

### GRADE REQUIREMENTS AND CORE COURSES

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

### COMPUTER SCIENCE

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

### MATHEMATICS

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

### PHYSICS

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

### DESIGN

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

### PROJECTS

The following courses are required: GAM 100, GAM 150, GAM 200, GAM 250, GAM 302, and GAM 352. Ten additional credits must be selected from other courses with the designation GAM that are numbered 375 or higher. (Total: 34 credits)

### HUMANITIES AND SOCIAL SCIENCE

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

### ART

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

### OPEN ELECTIVES

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

### NOTE ON GENERAL EDUCATION COURSES

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

# Recommended Course Sequence

## for the Bachelor of Science in Computer Science and Game Design

| SEMESTER              | COURSE  | COURSE TITLE   | CORE* | CREDITS   |
|-----------------------|---------|--|-------|-----------|
| Semester 1            | GAM 100 | Project Introduction                                 | X     | 3         |
|                       | GAT 110 | Game History   | X     | 2         |
|                       | GAT 120 | Game Analysis  | X     | 3         |
|                       | CS 100  | Computer Environment                                 | X     | 3         |
|                       | CS 100L | Computer Environment Lab                             | X     | 1         |
|                       | CS 120  | High-Level Programming I: The C Programming Language | X     | 4         |
|                       | MAT 140 | Linear Algebra and Geometry                          | X     | 4         |
|                       | COL 101 | College Life and Academic Skills                     | X     | 1         |
| <b>Semester Total</b> |         |  |       | <b>21</b> |
| Semester 2            | GAM 150 | Project I  | X     | 3         |
|                       | GAT 210 | Game Mechanics I                                     | X     | 3         |
|                       | CS 170  | High-Level Programming II: The C++ Language          | X     | 4         |
|                       | CS 230  | Game Implementation Techniques                       | X     | 3         |
|                       | MAT 150 | Calculus and Analytic Geometry I                     | X     | 4         |
|                       | ENG 110 | Composition  | X     | 3         |
| <b>Semester Total</b> |         |  |       | <b>20</b> |
| Semester 3            | GAM 200 | Project II   | X     | 4         |
|                       | GAT 211 | Game Mechanics II                                    | X     | 3         |
|                       | GAT 240 | Technology for Designers                             | X     | 3         |
|                       | CS 225  | Advanced C/C++                                       | X     | 3         |
|                       | MAT 200 | Calculus and Analytic Geometry II                    | X     | 4         |
|                       | PHY 200 | Motion Dynamics                                      | X     | 3         |
| <b>Semester Total</b> |         |  |       | <b>20</b> |
| Semester 4            | GAM 250 | Project III  | X     | 4         |
|                       | GAT 250 | 2D Game Design I                                     | X     | 3         |
|                       | CS 180  | Operating System I: Man-Machine Interface            | X     | 3         |
|                       | CS 280  | Data Structures                                      | X     | 3         |
|                       | ART 105 | Art Processes  | X     | 3         |
|                       | COM 150 | Interpersonal and Work Communication                 | X     | 3         |
| <b>Semester Total</b> |         |  |       | <b>19</b> |
| Semester 5            | GAM 302 | Project III for Designers                            | X     | 5         |
|                       | GAT 251 | 2D Game Design II                                    | X     | 3         |
|                       | CS 251  | Introduction to Computer Graphics                    | X     | 3         |
|                       | CS 380  | Artificial Intelligence for Games                    | X     | 3         |
|                       | ART 260 | Graphic Design, User Experience, and Input           | X     | 3         |
|                       | PSY 101 | Introduction to Psychology                           | X     | 3         |
| <b>Semester Total</b> |         |  |       | <b>20</b> |

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

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



# Bachelor of Science in Computer Science

## Program Overview

The Bachelor of Science in Computer Science degree program prepares students to develop software through a combination of computer science theory and continuous practical application in team-based projects. Students learn to gather, store, and analyze real-world data, to connect and harness the power of distributed computing devices, and to create digital interfaces that are natural and intuitive. This background prepares students to not only understand the technologies of today, but to find solutions to problems that seem unsolvable and collaboratively build the technologies of tomorrow.

Graduates of this program will be skilled at writing computer programs with core languages such as C and C++, reinforced by a strong knowledge of operating systems, compilers, assembly language, and computer hardware. Graduates of this program will be proficient in programming application logic, user interfaces, artificial intelligence, databases, and networked client-server applications. Graduates will be well-versed in data structures, algorithm analysis, software architecture principles, parallel computing techniques, software engineering techniques, software engineering practices, and software production methodologies. Graduates will have extensive experience working as individuals and in teams to test, iterate, and polish full software applications and tools, taking them from functional specification to final archiving.

Graduates of this degree program will be prepared to enter technical industries as entry-level software engineers. Possible entry-level positions include Software Engineer, Software Developer, Software Development Engineer, Software Development Engineer in Test, Quality Assurance Engineer, Software Analyst, Application Analyst, Computer Programmer, Artificial Intelligence Programmer, Networking Programmer, Server Programmer, Web Programmer, User Interface Programmer, Tools Programmer, or Game Developer. This degree program also includes secondary training that can contribute directly to a graduate obtaining positions such as Producer, Program Manager, Technical Program Manager, and Technical Writer. With sufficient experience in the industry, graduates may obtain positions such as Lead Engineer, Lead Program Manager, Development Manager, Software Architect, or Technical Director.

The BS in Computer Science degree program will start in 2015; we will begin reporting certain disclosures, including graduation and placement rates, in accordance with ACCSC reporting requirements. For other important information, including occupational profiles and cost of attendance, visit [digipen.edu/fileadmin/disclosures/BSCS.html](http://digipen.edu/fileadmin/disclosures/BSCS.html).

## Degree Requirements

### NUMBER OF CREDITS AND GPA

The BS in Computer Science degree program requires completion of at least 150 credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of 15 weeks each, or a total of four academic years.

### GRADE REQUIREMENTS AND CORE COURSES

Students must receive a grade of "C-" (or 1.7 quality points) or higher in all core courses. (In a non-core course, a grade of "D" [or 1.0 quality points] or higher is considered passing.) The core courses are all those taken to fulfill the projects, mathematics, and computer science requirements as described below. PHY 200 and PHY 200L are also core courses.

### COMPUTER SCIENCE

The following courses are required: CS 100, CS 100L, CS 120, CS 170, CS 180, CS 211, CS 212, CS 225, CS 230, CS 251, CS 260, CS 261, CS 280, CS 315, CS 325, CS 330, CS 355, CS 365, CS 375 and CS 381. Students must select two additional CS or ECE courses (6 credits) numbered 200 or higher. (Total: 66 credits)

### HUMANITIES AND SOCIAL SCIENCES

The following courses are required: COL 101, ENG 110, and COM 150. Six additional ENG credits are required from ENG 116 and above. Students must take an additional three credits in HIS, PSY, or SOS. (Total: 16 credits)

### MATHEMATICS

The following courses are required: MAT 140, MAT 150 or MAT 180, MAT 200 or MAT 230, MAT 250, MAT 258, MAT 340, and one MAT elective numbered 300 or higher, or MAT 256. (Total: 24 credits)

### PHYSICS

The following courses are required: PHY 200, PHY 200L, PHY 250, and PHY 250L. (Total: 8 credits)

### PROJECTS

The following courses are required: GAM 100, GAM 150, CSP 200, CSP 250, CSP 300, CSP 350, CSP 400, and CSP 450. (Total: 30 credits)

### OPEN ELECTIVES

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

### NOTE ON GENERAL EDUCATION COURSES

The following courses satisfy the general education requirement for the Bachelor of Science in Computer Science: COM 150 (3), ENG 110 (3), ENG electives numbered 116 or higher (6), a social science elective in HIS, PSY, or SOS (3), MAT 140 (4), MAT 150 or MAT 180 (4), MAT 250 (3), PHY 200 (3), PHY 200L (1), PHY 250 (3), and PHY 250L (1), for a total of 34 credits.



# Recommended Course Sequence for the Bachelor of Science in Computer Science

| SEMESTER              | COURSE                | COURSE TITLE  | CORE* | CREDITS   |
|-----------------------|-----------------------|---|-------|-----------|
| Semester 1            | MAT 140               | Linear Algebra and Geometry                             | X     | 4         |
|                       | CS 100                | Computer Environment                                    | X     | 3         |
|                       | CS 100L               | Computer Environment Lab                                | X     | 1         |
|                       | CS 120                | High-level Programming I: The C Programming Language    | X     | 4         |
|                       | GAM 100               | Project Introduction                                    | X     | 3         |
|                       | ENG 110               | Composition   |       | 3         |
|                       | COL 101               | College Life and Academic Skills                        |       | 1         |
| <b>Semester Total</b> |                       |   |       | <b>19</b> |
| Semester 2            | MAT 150 or<br>MAT 180 | Calculus and Analytic Geometry I or Vector Calculus I   | X     | 4         |
|                       | CS 170                | High-level Programming II: The C++ Programming Language | X     | 4         |
|                       | CS 230                | Game Implementation Techniques                          | X     | 3         |
|                       | GAM 150               | Project I   | X     | 3         |
|                       | COM 150               | Interpersonal and Work Communication                    |       | 3         |
| <b>Semester Total</b> |                       |   |       | <b>17</b> |
| Semester 3            | MAT 200 or<br>MAT 230 | Calculus and Analytic Geometry II or Vector Calculus II | X     | 4         |
|                       | CS 180                | Operating System I: Man-Machine Interface               | X     | 3         |
|                       | CS 211                | Introduction to Databases                               | X     | 3         |
|                       | CS 225                | Advanced C/C++  | X     | 3         |
|                       | CSP 200               | Computer Science Project II                             | X     | 4         |
|                       | PHY 200               | Motion Dynamics   | X     | 3         |
|                       | PHY 200L              | Motion Dynamics Lab                                     | X     | 1         |
| <b>Semester Total</b> |                       |   |       | <b>21</b> |
| Semester 4            | PHY 250               | Waves, Optics, and Aerodynamics                         |       | 3         |
|                       | PHY 250L              | Waves, Optics, and Aerodynamics Lab                     |       | 1         |
|                       | CS 212                | Advanced Databases                                      | X     | 3         |
|                       | CS 365                | Software Engineering                                    | X     | 3         |
|                       | CS 280                | Data Structures   | X     | 3         |
|                       | CSP 250               | Computer Science Project II                             | X     | 4         |
|                       | MAT 258               | Discrete Mathematics                                    | X     | 3         |
| <b>Semester Total</b> |                       |   |       | <b>20</b> |
| Semester 5            | CS 260                | Computer Networks I: Interprocess Communication         | X     | 3         |
|                       | CS 315                | Low-Level Programming                                   | X     | 3         |
|                       | CS 330                | Algorithm Analysis                                      | X     | 3         |
|                       | MAT 250               | Linear Algebra  | X     | 3         |
|                       | CS 251                | Introduction to Computer Graphics                       | X     | 3         |
|                       | CSP 300               | Computer Science Project III                            | X     | 4         |
| <b>Semester Total</b> |                       |   |       | <b>19</b> |

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

| SEMESTER              | COURSE                    | COURSE TITLE   | CORE* | CREDITS            |
|-----------------------|---------------------------|--|-------|--------------------|
| Semester 6            | MAT 340                   | Probability and Statistics   | X     | 3                  |
|                       | CS 355                    | Parallel Programming   | X     | 3                  |
|                       | CS 261                    | Computer Networks II   | X     | 3                  |
|                       | CS 375                    | Compilers and Interpreters   | X     | 3                  |
|                       | CSP 350                   | Computer Science Project III                                       | X     | 4                  |
|                       | Open Elective             | An elective of the student's choice from any department at DigiPen |       | 3                  |
| <b>Semester Total</b> |                           |  |       | <b>19</b>          |
| Semester 7            | CS 381                    | Introduction to Artificial Intelligence                            | X     | 3                  |
|                       | English Elective          | Any ENG course numbered 116 or higher                              |       | 3                  |
|                       | CS 325                    | User Interface and User Experience Design                          | X     | 3                  |
|                       | Math Elective             | MAT 256 or any MAT course numbered 300 or higher                   | X     | 3                  |
|                       | CSP 400                   | Computer Science Project IV  | X     | 4                  |
|                       | Open Elective             | An elective of the student's choice from any department at DigiPen |       | 3                  |
| <b>Semester Total</b> |                           |  |       | <b>19</b>          |
| Semester 8            | English Elective          | Any ENG course numbered 116 or higher                              |       | 3                  |
|                       | Computer Science Elective | Any CS or ECE course numbered 200 or higher                        | X     | 3                  |
|                       | Computer Science Elective | Any CS or ECE course numbered 200 or higher                        | X     | 3                  |
|                       | CSP 450                   | Computer Science Project IV  | X     | 4                  |
|                       | HSS Elective              | Any HIS, PSY or SOS course   |       | 3                  |
| <b>Semester Total</b> |                           |  |       | <b>16</b>          |
| <b>Degree Total</b>   |                           |  |       | <b>150 minimum</b> |

# Bachelor of Science in Computer Engineering

## Program Overview

The BS in Computer Engineering degree program at DigiPen prepares students to become engineers who understand both sides of the hardware-software interface, from designing circuits to developing operating systems. Multidisciplinary in scope, the BS in Computer Engineering degree program integrates the fields of electrical engineering and computer science. This program uniquely prepares graduates to design and develop embedded, digital, and computer systems. Graduates with a degree in Computer Engineering are highly skilled and ideally suited for industries that require cutting-edge hardware and software technologies.

Like students in DigiPen's other degree programs, the hallmark of the BS in Computer Engineering program is a variety of semester-long and yearlong projects where students receive critical feedback and evaluation from instructors who are experts in their respective fields. As they develop through the program, students have increasingly more creative control over their projects. These projects complement rigorous coursework in computer science, engineering, programming, mathematics, and physics. The BS in Computer Engineering degree program and the student projects 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.

## Student Outcomes

Upon completion of the Bachelor of Science in Computer Engineering Program, students are expected to achieve the following outcomes:

- » an ability to apply knowledge of mathematics, science, and engineering
- » an ability to design and conduct experiments, as well as to analyze and interpret data
- » an ability to design a system, component, or process to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- » an ability to function on multidisciplinary teams
- » an ability to identify, formulate, and solve engineering problems
- » an understanding of professional and ethical responsibility
- » an ability to communicate effectively the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

- » a recognition of the need for, and an ability to engage in life-long learning
- » a knowledge of contemporary issues
- » an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

## Program Objectives for Alumni

### 3-5 YEARS AFTER GRADUATION

The Bachelor of Science in Computer Engineering Program Educational Objectives are to produce graduates:

- » who are exceptionally competent computer engineers whose work is notable for its technical excellence and innovation;
- » with a broad spectrum of professional skills, including expertise in software, hardware, operating systems, circuit design, and embedded systems;
- » with an in-depth understanding of computer engineering practice and judgment via team projects that include design, implementation, and testing;
- » who are prepared and motivated for a lifetime of independent, reflective learning and critical thinking;
- » who are fully aware of the societal impacts of their work, both nationally and globally.

Graduates of this degree program have the necessary skills and preparation to work at entry-level hardware and software positions within various industries such as aerospace and avionics, automotive, consumer electronics, sciences, Internet of Things, entertainment, and defense. Some targeted areas within these industries include game systems, multimedia, mechatronics, human interface devices, artificial intelligence, operating systems, information systems, telecommunications, signal processing, control systems, and instrumentation.

Potential entry-level position titles for new graduates include: Software Engineer, Computer Hardware Engineer, Systems Engineer, Embedded Systems Engineer, Embedded Software Engineer, Firmware Engineer, Design Engineer, Development Engineer, Quality Control Engineer, Systems Test Engineer, Telecommunications Engineer, Software Developer, Software Analyst, Computer Programmer, and Graphics Hardware Engineer.

For details about graduation rates, median debt for students who complete this program, and other important information visit [digipen.edu/fieadmin/disclosures/CE.html](http://digipen.edu/fieadmin/disclosures/CE.html).

## Degree Requirements

### NUMBER OF CREDITS & GPA

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

## GRADE REQUIREMENTS AND CORE COURSES

Students must receive a grade of “C-” (or 1.7 quality points) or higher in all core courses. All required CS, ECE, MAT, and PHY courses are considered core courses. (In a non-core course, a grade of “D” or higher is considered passing.)

## ELECTRICAL AND COMPUTER ENGINEERING REQUIREMENTS

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

## COMPUTER SCIENCE REQUIREMENTS

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

## PHYSICS REQUIREMENTS

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

## MATHEMATICS REQUIREMENTS

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

## HUMANITIES AND SOCIAL SCIENCE REQUIREMENTS

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

## ART & MUSIC REQUIREMENTS

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

## ELECTIVES REQUIREMENTS

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

## A NOTE ON GENERAL EDUCATION COURSES

The following courses satisfy the general education requirement for the BS in Computer Engineering: ENG 110 (3), COM150 (3), Social Science elective (3), ART 210 (2), MAT 140 (4), MAT 150 or MAT 180 (4), MAT 200 or MAT 230 (4), PHY 200 (3), PHY 250 (3), and ECN 350 (3), for a total of 32 credits.

# Recommended Course Sequence for the Bachelor of Science in Computer Engineering

| SEMESTER   | COURSE                | COURSE TITLE   | CORE* | CREDITS |
|------------|-----------------------|--|-------|---------|
| Semester 1 | MAT 150 or<br>MAT 180 | Calculus and Analytics Geometry I or Vector Calculus I   | 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       |
|            | MAT 140               | Linear Algebra and Geometry                              | X     | 4       |
|            | ENG 110               | Composition  |       | 3       |
|            | COL 101               | College Life and Academic Skills                         |       | 1       |
|            | <b>Semester Total</b> |  |       |         |
| Semester 2 | MAT 200 or<br>MAT 230 | Calculus and Analytic Geometry II or Vector Calculus II  | X     | 4       |
|            | ECE 110               | CE 1st Year Project                                      | X     | 3       |
|            | CS 170                | High-level Programming II – The C++ Programming Language | X     | 3       |
|            | ECE 210               | Digital Electronics I                                    | X     | 4       |
|            | PHY 200               | Motion Dynamics  | X     | 3       |
|            | PHY 200L              | Motion Dynamics Lab                                      | X     | 1       |
|            | <b>Semester Total</b> |  |       |         |

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

| SEMESTER                    | COURSE                   | COURSE TITLE  | CORE* | CREDITS            |
|-----------------------------|--------------------------|---|-------|--------------------|
| Semester 3                  | COM 150                  | Interpersonal and Work Communication  |       | 3                  |
|                             | CS 225                   | Advanced C/C++  | X     | 3                  |
|                             | MAT 225                  | Calculus and Analytic Geometry III  | X     | 3                  |
|                             | MAT 256                  | Introduction to Differential Equations  | X     | 3                  |
|                             | ECE 220L                 | CE 2nd Year Project   | X     | 3                  |
|                             | PHY 250                  | Waves, Optics, and Thermodynamics   | X     | 3                  |
|                             | PHY 250L                 | Waves, Optics, and Thermodynamics Lab   | X     | 1                  |
|                             | <b>Semester Total</b>    |   |       |                    |
| Semester 4                  | MAT 258                  | Discrete Mathematics  | X     | 3                  |
|                             | CS 280                   | Data Structures   | X     | 3                  |
|                             | ECE 200                  | Electric Circuits   | X     | 3                  |
|                             | ECE 260                  | Digital Electronics II  | X     | 4                  |
|                             | ECE 300                  | Embedded Microcontroller Systems  | X     | 3                  |
|                             | PHY 270                  | Electricity and Magnetism   | X     | 3                  |
|                             | PHY 270L                 | Electricity and Magnetism Lab   | X     | 1                  |
|                             | <b>Semester Total</b>    |   |       |                    |
| Semester 5                  | CS 315                   | Low-level Programming   | X     | 3                  |
|                             | CS 330                   | Design and Analysis of Algorithms   | X     | 3                  |
|                             | ECE 270                  | Real-Time Operating Systems   | X     | 3                  |
|                             | ECE 310L                 | CE 3rd Year Project I   | X     | 5                  |
|                             | ART 210                  | Art Appreciation  |       | 2                  |
|                             | CS Elective              | Any of CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher                    |       | 3                  |
|                             | <b>Semester Total</b>    |   |       |                    |
| Semester 6                  | ECE 360L                 | CE 3rd Year Project II  | X     | 5                  |
|                             | ECE 420                  | Digital Signal Processing   | X     | 3                  |
|                             | CS/MAT/PHY Elective      | An elective in CS, MAT, or PHY numbered 200 or above  | X     | 3                  |
|                             | MAT 340                  | Probability and Statistics  | X     | 3                  |
|                             | ECN 350                  | Engineering Economics   |       | 3                  |
|                             | <b>Semester Total</b>    |   |       |                    |
| Semester 7                  | ECE 350                  | Control Systems   | X     | 3                  |
|                             | ECE 410L                 | CE 4th Year Project I   | X     | 5                  |
|                             | ANI/ART/FLM/MUS Elective | Any ANI, ART, FLM, or MUS course  |       | 3                  |
|                             | ENG Elective             | One ENG elective chosen from ENG 116 or higher  |       | 3                  |
|                             | Elective                 | An elective of the student's choice from any department at DigiPen (excluding ECE and CS courses) |       | 3                  |
|                             | CS Elective              | Any of CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher                    | X     | 3                  |
|                             | <b>Semester Total</b>    |   |       |                    |
| Semester 8                  | ECE 460L                 | CE 4th Year Project II  | X     | 5                  |
|                             | HSS Elective             | Any HIS, SOS, PSY, PHL, or LAW course   |       | 3                  |
|                             | Open Elective            | An elective of the student's choice from any department at DigiPen                                |       | 3                  |
|                             | Open Elective            | An elective of the student's choice from any department at DigiPen                                |       | 3                  |
|                             | CS Elective              | Any of CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher                    | X     | 3                  |
|                             | CS Elective              | Any of CS 245, CS 246, CS 260, CS 261, or any CS course numbered 300 or higher                    | X     | 3                  |
|                             | <b>Semester Total</b>    |   |       |                    |
| <b>Degree Program Total</b> |                          |   |       | <b>154 Minimum</b> |

# Bachelor of Science in Engineering and Sound Design

## Program Overview

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

The Bachelor of Science in Engineering and Sound Design degree program is a four-year undergraduate computer science degree program designed to prepare software engineers for careers in software development with an emphasis on music- and audio-related applications. The program includes training in computer audio, graphics, and real-time simulation programming. Graduates of this program are prepared for the following entry and intermediate level positions: Audio Software Engineer, Audio Engine Programmer, Engine and Tools Programmer, Game Developer, Software Engineer, Software Developer, Computer Programmer, Audio Production Editor, Recording Engineer, Sound Designer, and Dialog Editor.

The first BS in Engineering and Sound Design cohort matriculated in 2012; we will begin reporting certain disclosures, including graduation and placement rates, in accordance with ACCSC reporting requirements. For other important information, including occupational profiles and cost of attendance, visit [digipen.edu/fileadmin/disclosures/BSESD.html](http://digipen.edu/fileadmin/disclosures/BSESD.html).

## Degree Requirements

### NUMBER OF CREDITS AND GPA

The Bachelor of Science in Engineering and Sound Design degree program requires completion of 143 credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of 15 weeks each, or four academic years. Students must receive special permission in writing from their academic advisor to take more than 20 credits in either of their first two semesters.

### GRADE REQUIREMENTS AND CORE COURSES

Students must receive a grade of "C-" (or 1.7 quality points) or better in all core courses for the Bachelor of Science in Engineering and Sound Design. (In a non-core course a grade of "D" [or 1.0 quality points] is considered passing.) The core courses are: CS 100, CS 100L, CS 120, CS 170, CS 180, CS 225, CS 230, CS 245, CS 246, CS 251, CS 280, ECE 101L, ECE 200, GAM 100, GAM 150, GAM 200, GAM 250, GAM 300, GAM 350, MAT 140, MAT 150, MAT 200, MAT 220, MUS 120, MUS 120L, MUS 121, MUS 121L, MUS 150, MUS 150L, MUS 151, MUS 151L, MUS 250, MUS 250L, MUS 251, MUS 251L, PHY 200, PHY 250, PHY 320, PHY 321, and three MUS elective credits.

### COMPUTER SCIENCE

The following courses are required: CS 100, CS 100L, CS 120, CS 170, CS 180, CS 225, CS 230, CS 245, CS 246, CS 251, CS 280. (Total: 33 credits.)

### ELECTRICAL AND COMPUTER ENGINEERING

The following courses are required: ECE 101L, ECE 200. (Total: 4 credits.)

### FILM

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

### PROJECTS

The following courses are required: GAM 100, GAM 150, GAM 200, GAM 250, GAM 300, and GAM 350. (Total: 24 credits.)

### HUMANITIES AND SOCIAL SCIENCES

The following courses are required: COL 101, COL 499, COM 150, ENG 110, LAW 115, and three HSS elective credits. HSS Electives include courses with the following prefixes: COM (Communications), ECN (Economics), ENG (English), HIS (History), LAW (Law), MGT (Management), PHL (Philosophy), PSY (Psychology), and SOS (Social Sciences). (Total: 14 credits)

### MATHEMATICS

The following courses are required: MAT 140, MAT 150, MAT 200, and MAT 220. (Total: 15 credits.)

### MUSIC

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

### PHYSICS

The following courses are required: PHY 200, PHY 250, PHY 320, and PHY 321. (Total: 12 credits.)

### STEM (SCIENCE, TECHNOLOGY, ENGINEERING, MATH) ELECTIVE

The following courses are required: Nine credits taken from courses numbered 200 or higher from CS, ECE, MAT, or PHY. (Total: 9 credits.)

### OPEN ELECTIVES

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

## INTERNSHIP OPTION

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

## NOTE ON GENERAL EDUCATION COURSES

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

## Recommended Course Sequence for the Bachelor of Science in Engineering and Sound Design

| SEMESTER   | COURSE                | COURSE TITLE  | CORE* | CREDITS |
|------------|-----------------------|---|-------|---------|
| Semester 1 | CS 100                | Computer Environment                                    | X     | 3       |
|            | CS 100L               | Computer Environment Lab                                | X     | 1       |
|            | CS 120                | High-Level Programming I: The C Programming Language    | X     | 3       |
|            | GAM 100               | Project Introduction                                    | X     | 3       |
|            | MAT 140               | Linear Algebra and Geometry                             | X     | 4       |
|            | MUS 120               | Music Theory and Musicianship I                         | X     | 2       |
|            | MUS 120L              | Music Theory and Musicianship I Lab                     | X     | 1       |
|            | COL 101               | College Life and Academic Skills                        |       | 1       |
|            | <b>Semester Total</b> |   |       |         |
| Semester 2 | CS 170                | High-Level Programming II: The C++ Programming Language | X     | 4       |
|            | CS 230                | Game Implementation Techniques                          |       | 3       |
|            | GAM 150               | Project I   | X     | 3       |
|            | ECE 101L              | Introduction to Engineering Projects                    | X     | 1       |
|            | MAT 150 or<br>MAT 180 | Calculus and Analytic Geometry I or Vector Calculus I   | X     | 4       |
|            | MUS 121               | Music Theory and Musicianship II                        | X     | 2       |
|            | MUS 121L              | Music Theory and Musicianship II Lab                    | X     | 1       |
|            | <b>Semester Total</b> |   |       |         |
| Semester 3 | CS 180                | Operating System I: Man-Machine Interface               | X     | 3       |
|            | CS 225                | Advanced C/C++  | X     | 3       |
|            | ENG 110               | Composition   |       | 3       |
|            | MAT 200 or<br>MAT 230 | Calculus and Analytic Geometry II or Vector Calculus II | X     | 4       |
|            | MUS 150               | Sound Design Project I                                  | X     | 2       |
|            | MUS 150L              | Sound Design Project I Lab                              | X     | 2       |
|            | PHY 200               | Motion Dynamics   | X     | 3       |
|            | <b>Semester Total</b> |   |       |         |

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



| SEMESTER                    | COURSE                | COURSE TITLE   | CORE* | CREDITS            |
|-----------------------------|-----------------------|--|-------|--------------------|
| Semester 4                  | ECE 200               | Electric Circuits  | X     | 3                  |
|                             | CS 245                | Introduction to Interactive Sound Synthesis  | X     | 3                  |
|                             | FLM 115               | History of Film and Animation  |       | 3                  |
|                             | MAT 220               | Mathematics of Digital Sound Processing  | X     | 3                  |
|                             | MUS 151               | Sound Design Project II  | X     | 2                  |
|                             | MUS 151L              | Sound Design Project II Lab  | X     | 2                  |
|                             | PHY 250               | Waves, Optics, and Aerodynamics  | X     | 3                  |
|                             | <b>Semester Total</b> |  |       |                    |
| Semester 5                  | CS 246                | Advanced Sound Synthesis   | X     | 3                  |
|                             | CS 251                | Introduction to Computer Graphics  | X     | 3                  |
|                             | GAM 200               | Project II   | X     | 4                  |
|                             | MUS 250               | Sound Design Project III   | X     | 1                  |
|                             | MUS 250L              | Sound Design Project III Lab   | X     | 2                  |
|                             | PHY 320               | Acoustics I  | X     | 3                  |
|                             | COL 499               | Career Search Preparation: Materials, Logistics, and Communication                       |       | 1                  |
|                             | <b>Semester Total</b> |  |       |                    |
| Semester 6                  | CS 280                | Data Structures  | X     | 3                  |
|                             | GAM 250               | Project II   | X     | 4                  |
|                             | MUS 251               | Sound Design Project IV  | X     | 1                  |
|                             | MUS 251L              | Sound Design Project IV Lab  | X     | 2                  |
|                             | PHY 321               | Acoustics II   | X     | 3                  |
|                             | STEM Elective         | Science, Technology, Engineering, or Math Elective: CS, ECE, MAT, or PHY, over level 200 | X     | 3                  |
|                             | <b>Semester Total</b> |  |       |                    |
| Semester 7                  | COM 150               | Interpersonal and Work Communication   |       | 3                  |
|                             | GAM 300               | Project III  | X     | 5                  |
|                             | Open Elective         | An elective of the student's choice from any department at DigiPen                       | X     | 3                  |
|                             | STEM Elective         | Science, Technology, Engineering, or Math Elective: CS, ECE, MAT, or PHY, over level 200 | X     | 3                  |
|                             | STEM Elective         | Science, Technology, Engineering, or Math Elective: CS, ECE, MAT, or PHY, over level 200 |       | 3                  |
|                             | <b>Semester Total</b> |  |       |                    |
| Semester 8                  | GAM 350               | Project III  | X     | 5                  |
|                             | Open Elective         | An elective of the student's choice from any department at DigiPen                       |       | 3                  |
|                             | HSS Elective          | Humanities and Social Sciences Elective  |       | 3                  |
|                             | LAW 115               | Introduction to Intellectual Property and Contracts                                      |       | 3                  |
|                             | MUS Elective          | Music Elective   | X     | 3                  |
|                             | <b>Semester Total</b> |  |       |                    |
| <b>Degree Program Total</b> |                       |  |       | <b>143 minimum</b> |



# Bachelor of Fine Arts in Digital Art and Animation

## Program Overview

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

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

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

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

- A broad foundation of traditional and digital art techniques and production experiences using different media in both 2D and 3D art and animation. This base allows students to gain an overview of the profession and provides long-term adaptability.
- An area of production emphasis and focus. This enables students to target a specific sector of the industry upon

graduation. Each student will produce a portfolio to support this focus.

- Strong foundational skills in storytelling. This includes visual storytelling, literary traditions, story through dialog, story through acting, and cinematic conventions.
- Strong foundational skills in applied technology using industry-standard hardware and software. Students will be thoroughly familiar with modern interface and workflow conventions. They will also understand how to learn new software while maintaining a production schedule.
- A solid foundation in professional work habits and attitude. Students will understand how to utilize and integrate professional criticism into their work. Additionally, they will be able to identify and create work that meets professional quality standards. They will also understand production flow and be able to generate and maintain appropriate schedules and production goals for their work.
- Social perspective and civic accountability relative to the roles that animation plays in society. Students will explore the long-term ramifications of this industry and be able to intelligently discuss their responsibilities to the betterment of the animation industry and society as a whole.

Examples of student artwork and projects can be found in the Digital Gallery on DigiPen's website.

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

## Degree Requirements

### NUMBER OF CREDITS AND GPA

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

### GRADE REQUIREMENT AND CORE COURSES

Certain non-elective courses that are part of the DigiPen BFA in Digital Art and Animation course sequence are survey or introductory courses intended to widen the student's understanding and educational experience but are additional to, not central to the degree. These courses (SOS 115, PHY 115, CS 115,

and LAW 115) are all 100 level courses, which are not taught during the first year of the degree program. As such, they are considered to be non-core classes and the grading protocols for non-core courses apply (i.e., credit is given if the class is passed with a grade of “D” [or 1.0 quality points] or higher). All other courses, required or elective, are core courses and students must receive a grade of “C-” (or 1.7 quality points) or higher to pass.

### ANIMATION

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

### ART

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

### COMPUTER GRAPHICS

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

### ELECTIVES

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

### FILM

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

### HUMANITIES AND SOCIAL SCIENCE

The following courses are required: COL 101, LAW 115, SOS 115, ENG 116, and ENG 315. (Total: 15 credits)

### PROJECTS

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

### SCIENCE REQUIREMENTS

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

### NOTE ON GENERAL EDUCATION COURSES

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

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

| SEMESTER   | COURSE                | COURSE TITLE  | CORE* | CREDITS   |
|------------|-----------------------|---|-------|-----------|
| Semester 1 | ANI 101               | Introduction to Animation - Theories and Techniques I   | X     | 3         |
|            | ART 101               | The Language of Drawing                                 | X     | 3         |
|            | ART 110               | Fundamentals of Visual Communication and Design Process | X     | 3         |
|            | ART 115               | Art and Technology                                      | X     | 4         |
|            | COL 101               | College Life and Academic Skills                        | X     | 1         |
|            | ENG 116               | Storytelling  | X     | 4         |
|            | FLM 115               | History of Film and Animation                           | X     | 3         |
|            | <b>Semester Total</b> |   |       | <b>21</b> |
| 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         |
|            | <b>Semester Total</b> |   |       | <b>18</b> |

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

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

# Minors

## ART MINOR

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

- 3 credits from ART 101 or ART 102
- And 3 credits from ART 125 or ART 126

And 12 additional credits from the following:

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

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

## GAME DESIGN MINOR

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

## MATH MINOR

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

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

## MUSIC MINOR

To earn a music minor at DigiPen, a student must complete a block of 18 credits including the following:

- MUS 120, MUS 120L, MUS 121, MUS 121L (6 credits)
- 6 credits from any MUS course numbered 200 or higher
- The remaining 6 credits may be selected from MAT 120 or any MUS course
- At least 9 credits must be earned at DigiPen.
- All credits must be earned with a grade of “C-” (or 1.7 quality points) or better.

## PHYSICS MINOR

To earn a physics minor at DigiPen, a student must complete a block of 18 credits from PHY courses numbered 200 or above, or CS 550; at least 9 of these credits must be earned at DigiPen. All credits must be earned with a grade of “C-” (or 1.7 quality points) or better.

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

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

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

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

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

This program specializes in real-time interactive simulation and is designed to attract talented students who have recently graduated with a bachelor's degree in one of the following disciplines:

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

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

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

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

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

## Degree Requirements

### NUMBER OF CREDITS & GPA

The Master of Science in CS requires completion of at least 37 semester credits with a grade C or above in each course and a cumulative GPA of 3.0 or better. The full-time program typically spans four semesters of 15 weeks each and an additional semester to complete a thesis or comprehensive examination, for a total of two calendar years. The part-time program typically spans twelve semesters (including summer semesters) for a total of four calendar years. Students may choose to complete the program in less time by following an alternative three-year course sequence. For candidates with a lack of experience in computer graphics or mathematics, some articulation classes may be required.

### COMPUTER SCIENCE

CS 525, CS 529, CS 541, two courses from one of the concentration areas listed below, CS 598, and two additional CS courses numbered 500 and up are required. (Total: 22 credits)

#### CONCENTRATION AREAS:

- Artificial Intelligence
  - » CS 581
  - » one of the following courses: CS 580, CS 582
- Graphics
  - » CS 560
  - » one of the following courses: CS 561, CS 562, CS 500
- Physically-based Simulation
  - » PHY 500
  - » CS 550
- Image Processing
  - » CS 570
  - » one of the following courses: CS 571, CS 572

### ELECTIVE

One course from the following is required: any CS course numbered 500 and up, PHY 500, or any MAT course numbered 500 and up. (Total: 3 credits)

### MATHEMATICS

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

### PROJECTS

GAM 541 and two courses from the following: GAM 550, GAM 551, GAM 590, and GAM 591 are required. (Total: 9 credits)

### NOTE: THESIS OR EXTRA COURSE

CS 601 and CS 602 are required for the research and project theses tracks and will count toward fulfillment of the Computer Science Requirement. Students who choose the comprehensive examination track cannot receive credit for CS 602.

### 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. In any case, students are required to satisfactorily complete a minimum of 37 semester credits to earn a MS in Computer Science degree.

## Thesis and Examination Tracks

Students in the Master of Science in Computer Science program must select to focus their studies through the completion of one of three tracks: 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 careers 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.

### 1. RESEARCH THESIS (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 (CS 601 AND CS 602)

This option is similar to the research thesis. 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 thesis committee.

### 3. EXTRA COURSEWORK WITH COMPREHENSIVE EXAM

This option allows a student to take one or two additional electives offered at the graduate level to replace CS 602 or

both 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. To schedule an examination, the student shall complete the Comprehensive Examination Request Form no later than six weeks prior to the proposed examination date. The student and his or her academic advisor need to sign the form.

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
- Data Structures
- Advanced C++ (CS 525)
- Advanced Graphics (CS 541)

The subject part of the examination covers topics from a student's chosen concentration area (see Degree Requirements section.)

Each of the two parts of the examination will be given in a three-hour period and may be taken either on the same day or on different days. 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.

## Courses for the Academic Year 2015-2016

### Department of Animation and Production

#### PROJECTS COURSES

**PRJ 450 Senior Cinematic Project II** (5 cr.)

Prerequisite(s): PRJ 400

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

### Department of Computer Science

#### COMPUTER SCIENCE COURSES

**CS 120 High-Level Programming I: The C Programming Language** (4 cr.)

Prerequisite(s): None

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

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

Prerequisite(s): CS 120

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

**CS 174 Audio Scripting** (3 cr.)

Prerequisite(s): CS 116 or CS 120

This course covers concepts and implementation strategies for using a high-level scripting language to achieve complex audio behavior in game development. Topics include principles of analog and digital audio, psychoacoustics, and programming.



## CS 180 **Operating Systems I: Man-Machine Interface** (3 cr.)

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

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

## CS 601 **Research Methods in Computer Science** (3 cr.)

Prerequisite(s): Permission of Instructor

This course provides the student with an opportunity to study and apply research methods to a Computer Science topic of his/her choice. The student works with a faculty advisor to determine an appropriate area of research to survey, conducts a comprehensive survey of the area, and identifies tools and methods that may help the student in extending existing research. The student is required to write a survey report that summarizes the findings of this exploratory process.

## CS 602 **Master's Thesis** (3 cr.)

Prerequisite(s): CS 601

This course is the final part of the master's program thesis. Students work under the supervision of a thesis advisory committee to develop the theory and algorithms of the proposed research topic, usually leading to creation of 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 and pass an oral exam defending the thesis.

# Department of Digital Arts

## COMPUTER GRAPHICS COURSES

### CG 530 **Hair and Clothing Simulation** (3 cr.)

Prerequisite(s): CG 521

This course focuses on concepts and tools for the construction and simulation of hair and clothing models in 3D animation. Students explore techniques for generating models suitable for simulation, and the complexities inherent in simulating their behavior in the context of animation. Topics may include: evaluating and interpreting reference material, using a simulator, using parameters to control behavior, UV parameter assignment and texturing, detailing a model, fixing simulation problems, and shading and lighting as it pertains to their models.

# Department of Electrical and Computer Engineering

## ELECTRICAL AND COMPUTER ENGINEERING COURSES

### ECE 180 **Audio Concepts and Implementation** (3 cr.)

Prerequisite(s): CS 100, CS 120

This course provides an introduction to audio concepts and implementation. Students are introduced to the basics of digital audio processing, digital sound synthesis, and sound perception. These concepts are reinforced through the lab projects, where students work with audio programming at the sample level.

### ECE 225 **Robotics** (3 cr.)

Prerequisite(s): CS 100, ECE 260, PHY 200, PHY 200L

This course examines the theoretical and practical foundations of mobile robotics. Fundamental topics from structural design, sensors, actuators, motors, and artificial intelligence are covered individually. Systems-level concepts of human interface, distributed robotics, requirements engineering, and ethics are covered in an integrated manner.

# Department of Fine Arts

## ART COURSES

### ART 251 **Character Design** (3 cr.)

Prerequisite(s): ART 201, CG 201

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

### ART 228 **Figurative Sculpture** (3 cr.)

Prerequisite(s): ART 151, BIO 150

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



# Department of Humanities and Social Sciences

## ENGLISH COURSES

### ENG 243 **Epic Literature** (3 cr.)

Prerequisite(s): ENG 110 or ENG 116, ENG 150

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

## PSYCHOLOGY COURSES

### PSY 201 **Cognitive Psychology** (3 cr.)

Prerequisite(s): PSY 101

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

# Department of Game Software Design and Production

## GAME PROJECTS COURSES

### GAM 250 **Project II** (4 cr.)

Prerequisite(s): CS 225, GAM 200

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

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

# Department of Mathematics

## MATHEMATICS COURSES

### MUS 217 **Jazz Ensemble IV** (3 cr.)

Prerequisite(s): MUS 216 or Permission of Instructor

This course is a jazz ensemble workshop for the study of jazz performance practice and the rehearsal of repertory in preparation for a public concert at the end of the semester.

### MAT 320 **Mathematics of Digital Signal Processing I** (3 cr.)

Prerequisite(s): MAT 200

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

### MAT 321 **Mathematics of Digital Signal Processing II** (3 cr.)

Prerequisite(s): MAT 320

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

### MAT 560 **Advanced Algebra** (3 cr.)

Prerequisite(s): None

This course explores topics in linear algebra and abstract algebra. Topics in linear algebra include: vector spaces, transformations, canonical forms, and complex inner product spaces. Topics in abstract algebra include: introduction to abstract groups, rings, fields, and algebras. Further topics may include: modules, multivariate polynomials, algebraic varieties, tensor products, and duality.

### MAT 572 **Complex Analysis** (3 cr.)

Prerequisite(s): None

This course explores topics in complex analysis. Topics include: the complex number field and its geometry, complex functions, limits, complex differentiation, analytic functions, conformal mappings, contour integration, and Laurent series. Additional topics may include: Rouché's theorem, the maximum modulus theorem, Liouville's theorem, and applications.

### MAT 580 **Stochastic Processes** (3 cr.)

Prerequisite(s): None

This course is a formal introduction to stochastic processes with applications. The main topics are discrete and continuous time Markov chains, Poisson processes, random walks, branching processes, first passage times, recurrence and transience, and stationary distributions. The course also covers Brownian motion and martingales. Other topics may include renewal processes, queues, optimal stopping theory, Monte Carlo methods, and stochastic integration.

### **MAT 581 Statistical Inference and Data Analysis (3 cr.)**

Prerequisite(s): None

This course presents modern statistical concepts and methods developed in a mathematical framework. Topics include statistical inference, point and interval estimation, confidence intervals and hypothesis testing, sufficiency, Neyman-Pearson theory, maximum likelihood, Bayesian analysis, and large sample theory. Additional topics may include decision theory, linear models, and nonparametric statistics.

## Department of Music

### **MUSIC COURSES**

#### **MUS 117 Performance Ensemble II (1 cr.)**

Prerequisite(s): Permission of Instructor

This course is a performance ensemble workshop in which students study performance practice and rehearse repertory in preparation for a public concert at the end of the semester.

#### **MUS 150 Sound Design Project I (2 cr.)**

Prerequisite(s): None

Concurrent Course(s): MUS 150L

Credit may be received for MUS 150 or for MUS 115, but not for both.

This course provides an introduction to digital audio recording, processing, and mixing. Students are introduced to software and hardware components of the digital audio workstation, including microphones, mixers, MIDI sequencing and multitrack recording software. Further topics include fundamentals of acoustics, recording, sound synthesis, and MIDI.

#### **MUS 216 Jazz Ensemble III (1 cr.)**

Prerequisite(s): MUS 117 or Permission of Instructor

This course is a jazz ensemble workshop for the study of jazz performance practice and the rehearsal of repertory in preparation for a public concert at the end of the semester.

#### **MUS 370 Audio Design Project I (1 cr.)**

Prerequisite(s): GAM 250, MUS 121, MUS 121L

Concurrent Course(s): MUS 370L

Credit may be received for either MUS 150 or MUS 370, but not for both.

This course is the first of a two-semester lecture and lab sequence providing instruction and practice in the tools and techniques for the recording, editing and implementation of music, sound and voice for video games. This course focuses on the desktop digital audio workstation for the production of music and audio assets. Topics include principles of digital audio, non-linear sound design, synthesis, MIDI sequencing, and desktop audio recording.

#### **MUS 370L Audio Design Project I Lab (2 cr.)**

Prerequisite(s): GAM 250, MUS 121, MUS 121L

Concurrent Course(s): MUS 370

Students may not receive credit for both MUS 150L and MUS 370L.

This lab offers students hands-on experience in producing music and sound using a desktop digital audio workstation, applying the concepts and techniques presented in MUS 370. Students are required to apply knowledge and skills to produce original content and to implement it in a game project.

#### **MUS 371 Audio Design Project II (1 cr.)**

Prerequisite(s): MUS 370, MUS 370L

Concurrent Course(s): MUS 371L

This course focuses on the principles and operation of a multitrack digital recording studio while continuing to work with tools introduced in MUS 370. Topics include microphone techniques, tracking, mixing, mastering, foley, and field recording. This course is the second of a two-semester lecture and lab sequence providing instruction and practice in the tools and techniques for the recording, editing, and implementation of music, sound, and voice for video games.

#### **MUS 371L Audio Design Project II Lab (2 cr.)**

Prerequisite(s): MUS 370, MUS 370L

Concurrent Course(s): MUS 371

This lab offers students hands-on experience in producing music, sound effects, and voice recordings in a multitrack digital recording studio, applying the concepts and techniques presented in MUS 371. Students are required to apply their knowledge and skills as sound designers and composers on one or more game projects.

#### **MUS 470 Audio Design Project III (1 cr.)**

Prerequisite(s): CS 245, MAT 320, MUS 371, MUS 371L, PHY 320

Concurrent Course(s): MUS 470L

This course presents an overview of audio-engine design and implementation. Topics include: procedural music and sound design, parameterized audio components with user interfaces, relations between audio components in an audio engine, and case studies of existing production audio engines. Further topics may include: music-stitching systems, audio hooks to animation, synchronization issues, DSP chains, 3D-sound modeling, and randomization procedures.

#### **MUS 470L Audio Design Project III Lab (2 cr.)**

Prerequisite(s): CS 245, MAT 320, MUS 371, MUS 371L, PHY 320

Concurrent Course(s): MUS 470

This course presents a guided lab environment to pursue project work relating to topics in audio-engine design and implementation. Particular topics and project work may include: parameterized audio components with user interfaces,

procedural music and sound-design implementation, audio-plugin development, music-stitching systems, 3D-sound modeling, DSP-chain implementation, and randomization procedures.

**MUS 471 Audio Design Projects IV** (1 cr.)

Prerequisite(s): MAT 321, MUS 470, MUS 470L, PHY 321

This course covers the principles of physical-modeling sound synthesis, with an eye towards applications in game-audio development. Topics include: spectral models and spectral synthesis, differential equations as physical models, acoustic modeling with delay, comb and all-pass filters, digital waveguides, physical sound-effect modeling, and reverb models. Further topics may include: bowed-string models, interpolation of delay lines, time-varying delay models, plucked string and air column models, brass instrument models, and finite difference methods.

**MUS 471L Audio Design Project IV Lab** (2 cr.)

Prerequisite(s): MAT 321, MUS 470, MUS 470L, PHY 321

Concurrent Course(s): MUS 471

This course presents a guided lab environment to pursue project work relating to topics in physical modeling sound synthesis with applications in game audio development. Particular topics and project work may include: acoustic modeling with delay, comb and all-pass filters, digital waveguides, physical sound effect modeling, and reverb models. Further topics may include: bowed string models, interpolation of delay lines, time-varying delay models, plucked string and air column models, brass instrument models, and finite difference methods.

# Intensive English Preparation (IEP)

[Updated: June 1, 2015]

[Addition of elective options.]

## IEP Electives

|                  | COURSE   | TITLE                                 | CREDITS |
|------------------|----------|---------------------------------------|---------|
| <b>Electives</b> | IEP 001L | Language Lab I                        | 2       |
|                  | IEP 002L | Language Lab II                       | 2       |
|                  | IEP 003L | Language Lab III                      | 2       |
|                  | IEP 004L | Language Lab IV                       | 2       |
|                  | IEP 005L | English Language Lab V                | 2       |
|                  | IEP 050  | English Slang                         | 4       |
|                  | IEP 051  | Oral Communication                    | 4       |
|                  | IEP 052  | Test Preparation                      | 4       |
|                  | IEP 053  | American Culture                      | 4       |
|                  | IEP 054  | Topics in Humanities                  | 4       |
|                  | IEP 055  | Understanding Fiction                 | 4       |
|                  | IEP 056  | Personal and Professional Development | 4       |