DigiPen
INSTITUTE OF TECHNOLOGY
SINGAPORE

COURSE CATALOG

2014–2015

Notices

Authorization

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

Accreditation

DigiPen Institute of Technology is accredited by the Accrediting Commission of Career Schools and Colleges (ACCSC), a recognized accrediting agency by the U.S. Department of Education.

Registration With Council For Private Education (CPE)

DigiPen Institute of Technology Singapore is registered with the Council for Private Education (CPE).
CPE Registration No.: 200711322H
Registration Period: 21 June 2011 to 20 June 2017

DigiPen Institute of Technology Singapore will be offering the following degree programs in September 2014:

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

- Bachelor of Science in Computer Science and Game Design

- Bachelor of Fine Arts in Digital Art and Animation

- Bachelor of Arts in Game Design

For a list of institutions registered with Council for Private Education (CPE) in Singapore, you may refer to the CPE website at *http://www.cpe.gov.sg.*

Collaboration with Singapore Institute of Technology

On March 9, 2010, the Ministry of Education announced that the Singapore Institute of Technology (SIT), a national institute set up to offer additional pathways to diploma holders from the five local polytechnics obtain degrees from overseas higher education institutions, will partner with five international, highly reputable overseas higher education institutions to offer degree programs. DigiPen Institute of Technology Singapore was one of the universities invited to participate in this collaboration.

Under the collaboration, polytechnic graduates with related diplomas can apply through SIT to enroll the following degree programs at DigiPen Institute of Technology Singapore:

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

- Bachelor of Science in Computer Science and Game Design

- Bachelor of Fine Arts in Digital Art and Animation

- Bachelor of Arts in Game Design

Through this admission pathway, qualified candidates who are Singaporeans and Permanent Residents may enjoy certain credit transfers, and their tuition fees will be subsidized by MOE.

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Trademarks

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Important Notices

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

Students' information and records including but not limited to academic, disciplinary and financial information will be shared with Singapore Institute of Technology on a regular basis. DigiPen Institute of Technology Singapore Pte Ltd, reserves the right to make changes to the curricula and calendar without any prior notice.

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

Please note that when "Institute" is used in this book it means "DigiPen Institute of Technology Singapore."

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General Information

Name of the School (Branch Campus)

DigiPen Institute of Technology Singapore

CONTACT INFORMATION

DigiPen Institute of Technology Singapore
Pixel Building @ one-north
10 Central Exchange Green #01-01
Singapore 138649

Telephone: (65) 6577 1900
Facsimile: (65) 6577 1908
Email: *singapore@digipen.edu*
Web: *singapore.digipen.edu*

Name of the School (Main Campus)

DigiPen Institute of Technology

CONTACT INFORMATION

DigiPen Institute of Technology
9931 Willows Road NE
Redmond, WA 98052
USA

Telephone: (866) 478-5236 or (425) 558-0299
Facsimile: (425) 558-0378
Email: *info@digipen.edu*
Web: *www.digipen.edu*

Degree Authorization

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

Accreditation

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

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

2002: DigiPen was granted initial accreditation by ACCSC, including the approval for the Bachelor of Science in Real-Time Interactive Simulation degree program.

2002: DigiPen received ACCSC approval for the Bachelor of Fine Arts in Production Animation degree program.

2003: DigiPen received ACCSC approval for the Bachelor of Science in Computer Engineering degree program.

2005: DigiPen was granted a renewal of accreditation by ACCSC.

2006: DigiPen was granted approval for its Master of Science in Computer Science degree program by ACCSC.

2008: DigiPen was granted approval for its Bachelor of Arts in Game Design and Bachelor of Science in Game Design degree programs by ACCSC.

2010: DigiPen was granted approval for its relocation to its current facility by ACCSC.

2010: DigiPen received ACCSC approval which allows DigiPen Institute of Technology Singapore to disclose in its advertising that it is a branch campus of DigiPen Institute of Technology.

2010: DigiPen was granted approval to change the program name from the Bachelor of Fine Arts in Production Animation to the Bachelor of Fine Arts in Digital Art and Animation.

2011: DigiPen was granted approval to change the program name from the Bachelor of Science in Real-Time Interactive Simulation to the Bachelor of Science in Computer Science in Real-Time Interactive Simulation.

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

2011: DigiPen was granted approval for its Master of Fine Arts in Digital Arts degree program by ACCSC.

2012: DigiPen was granted approval for its Bachelor of Arts in Music and Sound Design and Bachelor of Science in Engineering and Sound Design degree programs by the ACCSC.

2012: DigiPen was granted approval to change the program name from the Bachelor of Science in Game Design to the Bachelor of Science in Computer Science and Game Design.

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

History of DigiPen Institute of Technology

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

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

Around this time, the video game industry underwent a paradigm shift from dealing primarily with 2D graphics and gameplay to full 3D worlds that players could freely explore. As these worlds became more sophisticated, so did the task of programming, designing, and animating them. In anticipation of this change, DigiPen developed a four-year

bachelor's degree in video game programming (the Bachelor of Science in Computer Science in Real-Time Interactive Simulation) that would prepare students for the challenges of creating complex 3D game and simulation software.

In 1996, the Washington State Higher Education Coordinating Board (HECB) granted DigiPen the authorization to award both Associate and Bachelor of Science degrees in Real-Time Interactive Simulation. Two years later, in 1998, DigiPen Institute of Technology opened its campus in Redmond, Washington, USA. In 1999, DigiPen began offering the Associate of Applied Arts in 3D Computer Animation. At this time, DigiPen phased out its educational activities in Canada, moving all operations to its Redmond campus. On July 22, 2000, DigiPen held its first commencement ceremony, where it awarded Associate of Science and Bachelor of Science degrees.

In 2002, DigiPen received accreditation from the Accrediting Commission of Career Schools and Colleges (ACCSC). In 2004, DigiPen began offering three new degrees: the Bachelor of Science in Computer Engineering, the Master of Science in Computer Science*, and the Bachelor of Fine Arts in Digital Art and Animation. In 2008, DigiPen added two more degree programs: the Bachelor of Science in Computer Science and Game Design and the Bachelor of Arts in Game Design.

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

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

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

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

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

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

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

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

Awards

DigiPen students have consistently excelled in both national and international game development competitions. At the annual Independent Games Festival (IGF) in San Francisco, California, DigiPen games have been nominated to the Student Showcase every year for the last 12 consecutive years. Since 2001, the IGF has granted 44 awards to 34 DigiPen student games. In 2007, 2008, and 2009, DigiPen projects also won the coveted Best Student Game award (for *Toblo*, *Synaesthete*, and *Tag: The Power of Paint*, respectively). In the IGF Main Competition, five DigiPen student games have been nominated for awards in various professional categories, and in 2004 *Bontago* won the "Innovation in Game Design" award while competing against professional developers. In 2011, the Independent Games Festival China, part of the annual Game Developers Conference China, selected three DigiPen games for its Student Competition which honors six of the top regional student games. DigiPen Singapore student game *Pixi* won the "Excellent Student Winner" award, while DigiPen Singapore student game *Void* won the "Best Student Game" award, as well as the "Excellence in Technology" award in IGF China's Main Competition.

Other competition highlights for DigiPen students include five finalist positions at the Slamdance Guerrilla Gamemaker Competition with two of those games winning their award categories, wins at the Northwest Games Festival, the Intel Games Demo, the IndieCade International Festival of Independent Games, and the PAX 10, as well as wins at the Indie Game Challenge, which in 2010 awarded the $100,000 nonprofessional Grand Prize to the DigiPen student game *GEAR* and in 2012 gave the Gamer's Choice Award to the DigiPen game *Nitronic Rush*. In 2011 at the Tokyo Game Show, only two of the 10 games showcased at the annual Sense of Wonder Night were from North America, with one of those, *Solstice*, being a DigiPen student project. Additionally, DigiPen students have won numerous awards at the Austin Game Developers Conference in Game Narrative Reviews and Poster Competitions.

Continuing Education Program*

DigiPen Institute of Technology Singapore is a Continuing Education and Training (CET) centre appointed by the Singapore Workforce Development Agency (WDA) for delivering Workforce Skills Qualification (WSQ) accredited training programs in game development.

The objective of the CET center is to train working adults in skills that contribute to the growth of the Interactive Digital Media industry in Singapore.

The full-time and part-time public-run programs are designed for individuals looking to enhance their knowledge of game development and computer animation or seeking a career transition into the game industry. The CET Center also serves as a resource for companies seeking specialists and customized training in the areas of software development, game design and digital art.

For updated listings and information about the CET programs please visit *singapore.digipen.edu/continuing-education*.

*Continuing Education Program does not fall within the scope of ACCSC accreditation

Pre-College Program

DigiPen's Pre-College Program is a challenging four-week program for students who have completed either their sophomore, junior, or senior year of high school. This program is designed to provide a preparatory experience for high school students interested in a potential career in the field of game programming, production art, or game design. For students who have strong academic potential and who may be considering entering one of DigiPen's degree programs, this rigorous, fast-paced program will provide a true taste of the college experience at DigiPen. Taught by DigiPen's faculty, students will be exposed to college-level content, as well as gaining insight into the collaborative environment at DigiPen.

There are three tracks being offered in game programming, game art production, and game design. Students who successfully complete a DigiPen Pre-College Program will be eligible to receive non-matriculated college credit issued by DigiPen Institute of Technology and will have developed an understanding of the game development process as it relates to the respective tracks, knowledge as to the key types of academic subjects that a student must study to be successful, and practical experience with the challenges of game production.

ProjectFUN Workshops

Now entering their 19th year, the ProjectFUN workshops engage elementary, middle and high school students in the arts and sciences by immersing them in the tools and techniques of today's high-tech careers. The workshops in Animation, Game Design, Video Game Programming, Multimedia Production, and Robotics enhance students' critical thinking skills, improve their knowledge of core subjects like math and physics, and excite their interest in the academic concepts underlying modern technology.

These workshops are taught at DigiPen's Redmond, WA, campus, DigiPen's branch campuses in Singapore and Spain, and various locations across the US and Canada. These workshops are also offered in a synchronous online environment year-round.

High School Technology Academies

In 2000, DigiPen began teaching a computer science program for junior and senior high school students who are interested in taking a challenging computer science program. There are currently Technology Academy sites in Washington and various other locations in the US and Canada, which teach Video Game Programming, 3D Animation, Robotics, and Media Communications. Starting Fall 2007, DigiPen began offering an online version of the Technology Academy to students in Washington State. This online program now includes students from across the nation.

For more information about DigiPen's Youth Programs, visit *projectfun.digipen.edu*.

Institutional Mission

Our mission is to provide an exemplary education and to further research in digital media, simulation, and interactive computer technologies by teaching the academic fundamentals and applied theory necessary for our students to lead, innovate, and advance these industries. Through the work of our students, faculty and staff, we strive to empower and inspire these industries on a global level.

Building on a strong foundation rooted in academics and industry experience, we challenge our students to apply their knowledge towards the creation of real-world products for the ever-advancing demands of a technological society. Embracing teamwork and creative exploration, our mission is to produce highly qualified leaders and originators who will instigate growth, productivity, innovation, and success in their professions and industries.

Notice of Non-Discrimination

DigiPen Institute of Technology Singapore is committed to maintaining a diverse community in an atmosphere of mutual respect and appreciation of differences.

DigiPen Institute of Technology Singapore does not discriminate in its educational and employment policies on the basis of race, color, creed, religion, national/ethnic origin, sex, sexual orientation, or age.

Programs of Study Offered

Currently, the Institute offers the following degree programs:

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

About DigiPen Institute of Technology Singapore's Facilities and Equipment

DigiPen Institute of Technology Singapore encompasses over DigiPen Institute of Technology Singapore encompasses over 2,200 square meters with a library, dedicated computer labs for students, and classrooms for lectures and instruction. The classrooms vary in size from lecture halls accommodating up to 70 students to small classrooms accommodating 15 students. The labs also vary in size from those accommodating 64 students to smaller ones seating 14 students.

Weekly student access to the Institute is from 8:00 A.M. to 12:00 A.M., Monday through Saturday, and from 12:00 P.M. to 12:00 A.M. on Sunday. Core office hours for the administrative staff run from 9:00 A.M. to 5:30 P.M., Monday through Friday, with additional hours as needed.

Major equipment items include PC workstations ranging from Core 2 Duo - 3GHz processors with 4GB RAM to Xeon processors with 24GB RAM and Quadro FX graphics cards. These computers are equipped with industry software for

2D and 3D animation production and development tools for game engine creation. All computers are on an internal network and have access to printers, servers, and archival media. The Institute upgrades the computer equipment on a periodic basis. As the student body population grows larger each year, the Institute will acquire additional equipment to accommodate that growth.

Description of the Library Facilities and Internet Access

LIBRARY SERVICES

DigiPen Institute of Technology Singapore's library aims to support the Institute's curriculum, students, and faculty. Students have access to a variety of resources and reference books relevant to their program of study. The library also subscribes to a selection of major journals and magazines related to the fields of gaming, simulation, and animation. Furthermore, the Institute's library allocates an annual budget for updating the contents of the library. In addition to these curriculum-related resources, the library has a collection of career-oriented materials, including books on resumes, cover letters, and interviews.

INTERNET ACCESS

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

Student Network and Internet Usage Policy

GENERAL POLICIES

The Institute's computer and network resources are provided exclusively for educational purposes. To ensure that these resources remain available for legitimate academic usage, the Institute requires compliance with the following policies:

- Students are required to respect the Institute's property. Students may not abuse, damage, vandalize, steal, or in any way alter the Institute's property in any manner that would prevent another student from using it.

- Students may not install software, drivers, patches, or any other program on the Institute's computers. Additional software may be requested through an instructor; it is the sole responsibility of the Institute to decide if, how, and when any software is installed.

- Students are responsible for their own data and are encouraged to protect their work by utilizing the resources provided by the Institute and by using a personal storage device such as a flash drive or laptop computer.

- Students may not attempt to access another student's information or display any material that may offend another student.

- Students may not copy, publish, or make available any of the Institute's property without written consent. This includes, but is not limited to, storing materials on any unauthorized network service or personal server.

- Commercial use of the Institute's computer or network resources is expressly and strictly forbidden. Any commercial activity will result in legal action against the offender.

- The Institute reserves the right to monitor, log, and inspect any data stored on any Institute computer or transmitted over the Institute network without restriction or limitation in order to ensure compliance with the above policies. Students found to be in violation of these policies may be restricted from the Institute's network and subject to disciplinary action.

INTERNET FILTER POLICY

Internet access through the Institute's network is filtered to ensure that students are better able to access information and materials related to their education. All internet traffic from within the Institute's network, including labs, classrooms, and administrative offices, are sent through a system of proxies, filters, and analyzers to protect school resources from outside disruption, prevent network abuse, and prioritize legitimate educational usage. If you have any questions or concerns about this policy, or you would like to report a problem with internet access, contact *helpdesk.sg@digipen.edu*.

Important Dates

Institutional Calendar

- **T.B.A.**
  Orientation—First Year Students

- **August 29, 2014**
  Last day to submit Campus Transfer Requests for Spring 2014

- **September 1, 2014**
  Classes Begin—Fall Semester

- **September 8, 2014**
  Last day to add classes for Fall Semester

- **September 15, 2014**
  Final day to drop classes without academic penalty

- **October 5, 2014**
  Hari Raya Haji Observed*
  No Classes

- **October 23, 2014**
  Deepavali Observed*

  Final day to receive 'W' on transcript for Fall Semester withdrawals.

  Withdrawals from the Institute after this date will receive 'F' grades on transcript.

  Final day to drop a class.
  No Classes

- **November TBA, 2014**
  Registration Period for Spring 2015

- **November 28, 2014**
  Last day to submit Campus Transfer Requests for Spring 2015

- **December 8–12, 2014**
  Fall Semester Final Exams

- **December 12, 2014**
  Fall Semester Ends

- **December 13, 2014–January 4, 2015**
  Winter Break
  No Classes

- **January 2, 2015**
  Last day to submit Change of Major Requests for Summer 2015

- **January 5, 2015**
  Classes Begin—Spring Semester

- **January 12, 2015**
  Last day to add classes for Spring Semester

- **January 19, 2015**
  Final day to drop class without academic penalty

- **February 3, 2015**
  Founder's Day
  No Classes

- **February 19–20, 2015**
  Chinese New Year Observed*
  No Classes

- **February 19-20, 2015**
  Spring Semester Ends

- **February 26, 2015**
  Final day to receive 'W' on transcript for Spring Semester withdrawals.

  Withdrawals from the Institute after this date will receive 'F' grades on transcript.

  Final day to drop a class.

- **March TBA, 2015**
  Registration Period for Summer 2015

- **March 27, 2015**
  Last day to submit Change of Major Requests for Summer 2015

- **March 31, 2015**
  Last day to submit Transfer/Waiver Credit Requests for Summer 2015

- **April 3, 2015**
  Good Friday Observed*
  No Classes

- **April 13–17, 2015**
  Spring Semester Final Exams

- **April 17, 2015**
  Spring Semester Ends

- **April 18–May 3, 2015**
  Intersession
  No Classes

- **May 5, 2015**
  Classes Begin–Summer Semester

- **May 12, 2015**
  Last day to add classes for Summer Semester

- **May 19, 2015**
  Final day to drop class without academic penalty

- **June TBA–August TBA, 2015**
  Registration Period for Fall 2015

- **June 26, 2015**
  Final day to receive 'W' on transcript for Summer Semester withdrawals.

  Withdrawals from the Institute after this date will receive 'F' grades on transcript.

  Final day to drop a class.

- **July 17, 2015**
  Hari Raya Puasa Observed*
  No Classes

- **July 24, 2015**
  Last day to submit Change of Major Requests for Fall 2015

- **August 9, 2015**
  National Day Observed*
  No Classes

- **August 10–14, 2015**
  Summer Session Final Exams

- **August 14, 2015**
  Summer Session Ends

Singapore Public Holiday

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

Deadlines**

- **July 1, 2014**
  Tuition deposit due for Fall 2014 semester

- **August 1, 2014**
  Tuition balance due for Fall 2014 Semester

- **August 31, 2014**
  Last day to drop Fall 2013 Semester courses for 100% refund

- **September 8, 2014**
  Withdrawal deadline for 90% refund

- **September 28, 2014**
  Withdrawal deadline for 75% refund

- **October 1, 2014**
  Tuition deposit deadline for Spring 2015

- **October 23, 2014**
  Withdrawal deadline for 50% refund

- **December 1, 2014**
  Tuition balance due for Spring 2015

- **January 4, 2015**
  Last day to drop Spring 2015 Semester courses for 100% refund

- **January 12, 2015**
  Withdrawal deadline for 90% refund

- **February 1, 2015**
  Withdrawal deadline for 75% refund

- **February 26, 2015**
  Withdrawal deadline for 50% refund

- **April 1, 2015**
  Tuition Balance due for Summer 2015 session

- **May 10, 2015**
  Last day to drop Summer 2015 Session courses for 100% refund

- **May 12, 2015**
  Withdrawal deadline for 90% refund

- **June 1, 2015**
  Withdrawal deadline for 75% refund

- **June 26, 2015**
  Withdrawal deadline for 50% refund

- July 1, 2015
  Tuition deposit due for Fall 2015 semester

- **August 1, 2015**
  Tuition deposit due for Fall 2015 Semester

**The deadlines mentioned above are applicable to NON-SIT students only.

Tuition and Fees

Tuition, Miscellaneous and Incidental fees

All tuition, miscellaneous and incidental fees are collected by SIT. For the most updated information, please refer to the SIT's website at www.singaporetech.edu.sg, SIT student handbook or contact SIT's Admissions department.

Books and Supplies

Textbooks and supplies are estimated to be approximately S$1,500.00 (plus 7% GST) per year. This cost is not included as part of the tuition.

Cancellation and Refund Policies 2014-2015

The Institute's Cancellation Policy:

Applicants who have not visited the school prior to enrollment will have the opportunity to withdraw without penalty within three (3) 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.

Singapore Institute of Technology's Refund Policies: Students who withdraw before their matriculation date will receive a full refund less S$100.00* administrative fee;

Students who choose to withdraw between their matriculation date and the start of their program will receive a refund of 50% of the tuition fee less S$100.00* administrative fee;

No refund will be given for withdrawal after commencement of the program.

*All prices quoted excludes 7% GST

For more information, please refer to SIT's website at www.singaporetech.edu.sg, SIT's student handbook or contact SIT's Admissions department.

Financial Assistance*

MDA Media Education Scheme

(For Singaporean citizens and Permanent Residents only)

Singapore's Media Development Authority (MDA) offers a yearly scholarship for students pursuing higher education in media industry-related fields. For more details and to apply for the scholarship, please contact the MDA directly at www.mda.gov.sg.

Financial Assistance Schemes Offered by SIT

(For Singaporean citizens and Permanent Residents only)

Students enrolled at DigiPen Institute of Technology Singapore are eligible to apply for financial assistance schemes offered by SIT.

For more information about financial assistance schemes and scholarships offered by SIT, please visit www.singaporetech.edu.sg or contact SIT's Admissions department.

Financial assistance schemes and scholarships are available to those who qualify.

Applying to DigiPen Institute of Technology Singapore

Visiting DigiPen Institute of Technology Singapore

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

Visitors interested in learning about the Institute's admission requirements, application process, and degree programs are encouraged to schedule a one-on-one meeting and school tour with an Admissions representative. To schedule an appointment, please contact the Admissions Office at admissions.sg@digipen.edu.

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

Undergraduate Application Process

The admission process is administered by SIT and involves the following steps:

1. Applicant applies and submits online application through SIT's application portal. This application form is available at: https://adm.singaporetech.edu.sg/sitadmission/

2. The application received at SIT goes through centralized processing.

3. Applicants are shortlisted for interviews.

4. All applicants are notified about their application status via email or through SIT's online application system, www.singaporetech.edu.sg.

5. Successful applicants can accept offer at Joint Acceptance Platform or by completing an acceptance form (as stipulated in the e-offer letter).

6. Applicants who accepted offer will receive a pre-matriculation package via email.

7. Successful applicants will need to complete the pre-matriculation procedure by stipulated deadline.

8. Successful applicants will then matriculate to SIT and collect the SIT Matriculation card.

For more information about the admission process, please visit *www.singaporetech.edu.sg.*

Except where noted, all undergraduate applicants must submit the following for consideration:

1. All application forms: Must be submitted online through SIT's admission portal at *www.singaporetech.edu.sg.*

2. An application fee of $18 (includes GST) will be payable to SIT. Payments can be made using one of the following methods:

   • Cheque / Bank draft / Money order / Cashier's order made payable to "Singapore Institute of Technology"

   • Please indicate your Name, I/C No., and application number on the back of the cheque.

   • You will need to mail the cheque/ money order / cashier order/ bank draft to:

   • Singapore Institute of Technology
   EFG Bank Building
   25 North Bridge Road, #02-00
   Singapore 179104
   (Finance Department)

   • NETs through the Admissions Office at 25 North Bridge Road, #02-00, EFG Bank Building.

   • Internet Banking Payment for DBS/POSB customers.

   • Online payment via eNETs.

3. Educational Records: Original documents must be presented to the Institute or to SIT for verification. As an alternative, documents may be certified by an official school representative or other authorized notary and sent directly to the Institute by the school or notary in a sealed envelope. Transcripts issued in a language other than English must be accompanied by literal translations completed by a recognized translating organization.

   • Junior Colleges in Singapore (or other students who have sat for the Singapore-Cambridge GCE "A" Level exams):

     o Certified-true copy of GCE "O" Level exam results or certificate.

     o Certified-true copy of Junior College transcripts showing the grades for all courses taken by the student.

     o Certified-true copy of Junior College diploma/certificate.

     o Certified-true copy of GCE "A" Level exam results or certificate.

   • Any of Singapore's five Polytechnics:

     o Certified-true copy of GCE "O" Level exam results or certificate.

     o Certified-true copy of Polytechnic transcripts showing the grades for all courses taken by the student.

     o Certified-true copy of Polytechnic diploma.

   • Any of Singapore's International Schools/schools outside of Singapore:

     o Certified-true copy of all transcripts showing the grades for all courses taken by the student.

o Certified-true copy of diploma showing proof of completion of high school level education sufficient for entrance to university.

o Certified-true copy of foreign educational credentials (e.g., Malaysia STPM, UEC, India Standard XII-CBSE, ISCE, Indonesia SMA UAN, Vietnam High School Graduation Certificate, etc.) demonstrating that the applicant has completed high school education.

Applicants, who do not fall under any of the above categories, please contact the Admissions Office at DigiPen Institute of Technology Singapore at *admissions.sg@digipen.edu.*

4. Personal statement: To be completed within SIT's online application portal. Please see the Personal Statement section below for the requirements and recommendations about completing this important component of the application.

5. Letters of recommendation (Optional): Two letters of recommendation from individuals familiar with your academic background and/or work ethic, i.e. instructor, guidance counselor, employer. Recommendation letters from family members will not be considered.

6. Official scores for the Test of English as a Foreign Language (TOEFL): This score is needed if English is not the Applicant's first language. This requirement can be waived if the Applicant has proof of completing at least four years of his or her most recent education at an institution in which English is the primary language of instruction. The Institute's TOEFL code is: 1493. Please see the section on Proof of Proficiency in the English Language for additional information.

7. Other official documentation (when applicable): This includes, but is not limited to, SAT scores, proof of legal permanent residency in Singapore, certified transcripts from all institutions of tertiary education (e.g., university transcripts), proof of citizenship in Singapore (e.g. I/C, passport, etc.) and photocopies of the personal particulars.

8. Official scores for the SAT 1 (recommended for BS in Computer Science and Real-Time Interactive Simulation and BS in Computer Science in Game Design applicants only): The Institute's SAT code: 5473. Applicants who fail to register for SAT 1 may be required to sit for a written Math Assessment conducted by the Institute. Please see the Math & Science Requirements & Recommendations for Bachelor of Science Applicants section for details.

9. Art portfolio: This is only required of applicants to the Bachelor of Fine Arts in Digital Art and Animation degree program. Please see the Portfolio section for complete details about this important component of the application.

PERSONAL STATEMENT

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

TOPIC
Please address the following:
Reasons for Applying: This section is required for ALL undergraduate applicants regardless of the program to which they are applying.

Obtaining a degree from DigiPen Institute of Technology Singapore will prepare you to be a software engineer/game

programmer (BS in Computer Science in Real-Time Interactive Simulation), technical designer (BS in Computer Science and Game Design), game designer (BA in Game Design), or digital artist (BFA in Digital Art and Animation). Write an essay that describes an exceptional achievement that highlights your academic and employment experience gained. How would these support your choice of program(s) and help you attain your goal(s) in life? What are your plan(s) upon graduation? Spelling, grammar, and sentence structure, along with the correct use of punctuation, capitalization, quotation marks, etc. are all considered, so proofread your essay carefully.

OPTIONAL ESSAY

Applicants should use this optional essay to explain any unusual circumstances or situations that they think may have an impact on their application.

SUBMISSION

Applicants must submit their personal statement via SIT's online application portal at: *https//admin.singaporetech.edu.sg/sitadmission/.* Answers must be drafted and prepared before beginning the online application.

PROOF OF PROFICIENCY IN THE ENGLISH LANGUAGE

- Non-native English speakers must provide proof of English proficiency in one of the following ways:
- A minimum Test of English as a Foreign Language (TOEFL) score of 550 (paper exam), 213 (computer exam), or 80 (IBT - Internet-Based Test). TOEFL code: 1493.

- A minimum International English Language Testing System (IELTS) score of 6.5 or higher.

- A minimum Cambridge English: Advanced (also known as a Certificate in Advanced English or CAE) score of C1 or higher.
- Completion of four years of high school at an English-speaking school, or an International School where the primary language of instruction is English.

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

- The Institute may accept other proof of English proficiency, such as internationally recognized standardized English test scores, the completion of English preparatory coursework, or internal English assessments on a case-by-case basis.

- The Institute may use its discretion and own internal assessments in determining sufficient English proficiency for students transferring from one DigiPen campus or program to another.

MATH AND SCIENCE REQUIREMENTS AND RECOMMENDATIONS FOR BACHELOR OF SCIENCE AND BACHELOR OF ARTS IN GAME DESIGN APPLICANTS

In addition to the requirements listed for all undergraduate applicants, those applying to any of the Bachelor of Science programs must have completed grade 12 or more recent coursework with a recommended "B" (or 3.0 quality points) or better average in mathematics.

At a minimum, applicants to any of the Institute's Bachelor of Science programs and the Bachelor of Arts in Game Design programs should have completed coursework in algebra and

geometry. Moreover, Bachelor of Science applicants need to have completed precalculus – or be in the midst of completing it – before we can evaluate their application. Please note that if an applicant is currently enrolled in precalculus, he or she must submit the first quarter/semester grade for this course. Although not required, the Institute strongly encourages Bachelor of Arts in Game Design applicants to complete through precalculus.

Admissions will try to evaluate an applicant's application based on the current grade in precalculus. Applicants who have not completed precalculus or are not currently enrolled in a precalculus course should contact *admissions.sg@digipen.edu* for recommendations on fulfilling this requirement.

Additionally, applicants to the Bachelor of Science programs are encouraged to take calculus, physics, computer science, and related AP courses before coming to DigiPen Institute of Technology Singapore.

MATH ASSESSMENT (REQUIRED FOR APPLICANTS WHO ARE UNABLE TO SIT FOR SAT 1)

At its discretion, the Institute may utilize a Math Assessment to assist in determining an applicant's knowledge in algebra, geometry, and trigonometry. Based on the result of the Math Assessment, an applicant may be required to successfully complete remedial mathematics courses taught at the Institute prior to starting a degree program, provided that the applicant meets all other minimum academic and admissions requirements.

BFA IN DIGITAL ART AND ANIMATION ART PORTFOLIO

DigiPen Institute of Technology Singapore reviews applicants' portfolios to ensure that students have the appropriate foundational skills to succeed in the degree programs to which they are applying. Applicants to the Digital Art and Animation degree are required to submit an art portfolio. This portfolio must contain between 15 to 20 samples of original artwork created by the applicant. At least 10 pieces must be drawings from direct observation, rather than from photos, other 2D references, or the student's imagination. The remaining pieces should demonstrate the applicant's artistic range and skill. Animations, figure/animal studies, character designs, architectural renderings, landscape studies, sculptures, and paintings are preferred for this part of the portfolio. If necessary, the Institute may request more samples for review.

THE PORTFOLIO SHOULD DEMONSTRATE THE FOLLOWING:

1. The applicant has sufficient foundational drawing skills to meet the challenges of the Institute's rigorous curriculum. The portfolio should include at least 10 drawings directly from live observations, preferably of still life (not from the applicant's imagination or from 2D references such as a photograph or another artist's work). These drawings should clearly communicate the structure and 3D form of the subject. The applicant should focus on representational accuracy rather than on cartooning or heavy stylization.

2. The applicant is a serious amateur artist. The portfolio should include five to 10 samples of the applicant's best work, regardless of the subject matter or medium. Sustained drawings (i.e. those that took two to three

hours to complete) are encouraged to demonstrate the applicant's skill and concentration. These works should be selected with an eye toward quality, design, composition, and a dedication to craft.

Please keep the following in mind when submitting your portfolio:

- Applicants should label portfolios clearly with their name on the front.
- All artwork should be labeled with the date of completion and medium used.
- Color copies, photocopies, slides, photographs, or work contained on CDs will be accepted, since portfolios will NOT be returned.
- Applicants who submit hard copies of artwork should contain their portfolios in A4 size binders.

Admission/Denial to DigiPen Institute of Technology Singapore's Programs

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

Accepted undergraduate applicants will receive an enrollment packet via standard mail. This packet includes an official letter of acceptance, and, if applicable, a transfer credit evaluation letter and/or a request to furnish proof of high school graduation, polytechnic diploma or completion of a bachelor's degree before the start of classes in the fall. Students will receive their student enrollment agreement by email. By returning the signed enrollment agreement and proof of graduation, an applicant has confirmed enrollment. Applicants who are accepted and enrolled are required to attend an official orientation session prior to the start of the program. Applicants who are not accepted to the Institute will receive a letter of rejection via email by SIT. When possible, the Institute will attempt to provide information about the specific areas in which an applicant needs improvement if he or she wishes to reapply in subsequent years. Please see the section on the Reapplication Process for more information.

Reapplication Process

Applicants who are denied admission are encouraged to reapply for a future year. By improving the areas suggested on the original decision letters (e.g. devoting more time and energy to a new art portfolio, etc.), many of those individuals reapplying for admission are accepted. To reapply, applicants should submit a new application through the SIT application portal at *www.singaporetech.edu.sg.*

Readmission Information

Any student who wishes to return to the Institute after an absence may apply to do so by contacting SIT's admission team. SIT or the Institute may require certified true copies of transcripts from all institutions attended since last attending the Institute and other official documentation for specific circumstances as requested below:

MEDICAL WITHDRAWALS

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

READMISSION AFTER ACADEMIC DISMISSAL

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

READMISSION AFTER DISCIPLINARY ACTION

Applicants should include a formal appeal for the Disciplinary Committee to review along with their application for readmission. Applicants previously withdrawn for disciplinary reasons must receive clearance from the Disciplinary Committee to return.

READMISSION FOR PERSONAL REASONS

There are usually no impediments to returning to the Institute if there is space available; however, an academic plan may need to be developed with the student's advisor upon re-enrollment, and students requesting readmission after an extended period of time must meet with an academic advisor to determine the viability of completing their degree program.

READMISSION AFTER NON-PAYMENT OF ACCOUNT

Outstanding accounts must first be settled before applying for readmission. Once settled, the policy for readmission follows the same guidelines listed under "Readmission for Personal Reasons".

Exceptions to these requirements will only be made on a case-by-case basis at the discretion of SIT and the Institute.

SUBMISSION OF OFFICIAL TRANSCRIPTS OF NON-DIGIPEN INSTITUTE OF TECHNOLOGY SINGAPORE COURSEWORK

All readmission applicants to DigiPen Institute of Technology Singapore must request an official transcript from the Institute's Registrar's Office to be sent to the Admissions Office as part of their application. Additionally, if the applicant has taken courses from another college since leaving the Institute, he/she must also have any and ALL official transcripts forwarded to the Admissions Office from the Registrar of each institution attended. The transcripts should show all academic work until the last semester or quarter completed. If the applicant is approved for readmission with coursework in progress, his/her admission status will be provisional, pending receipt of the final transcript(s). Finally, readmission applicants who are applying for readmission more than one year after withdrawing and who are not native English speakers may have to submit additional Proof of English language proficiency. Please see the Proof of English Language Proficiency section.

Non-Matriculated Studies

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

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

2. Upon application, a degree program track must be selected and additional corresponding materials may be required.

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

4. Students must receive a grade of "C-" (or 1.7 quality points) or better to pass courses that are core to their chosen track.

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

6. Applicants who are not native English speakers must provide Proof of English Language proficiency. Please see the Proof of English Language Proficiency section.

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

Waiver Credit, AP Examinations, CLEP, and Other Credit

Students may apply for course waivers if they can demonstrate that their knowledge and skills - whether they were gained by formal education, exam, work experience, or life experience – are equivalent to those gained by courses offered at DigiPen Institute of Technology Singapore. Credit may be granted through other means: Advanced Placement (AP) Exam scores, International Baccalaureate (IB) courses, College-Level Examination Program (CLEP) subject exam scores, or transfer credits from other post-secondary institutions. A maximum of nine credits per semester may be earned by these means. Course transfers and waivers are processed at S$42.80 (inclusive of 7% GST) per credit.

Course Waiver Examinations

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

at the Institute, and they may not be repeated. Students have the opportunity to waive designated core courses by demonstrating mastery of the material in two steps:

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

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

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

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

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

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

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

4. Examinations may not be repeated.

5. Repeat course work and "F" grades (or 0 quality points) are not open to waiver requests.

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

Advanced Placement Examinations

Course waivers or credit may be granted for satisfactory achievement on Advanced Placement Exams of the College Entrance Examination Board taken within the last 10 years. An exam score of four or above earns from three to six course waiver credit hours. No grades will be assigned to the courses, nor will they be figured into a student's grade point average. Courses waived or transferred are entered on students' transcripts, but no grades or quality points are awarded. Official results must be sent to the Registrar before course waivers or transfers are granted.

The Institute's course credits may be waived or transferred through AP examinations, and these may be applied to satisfy the Institute's degree requirements. The examinations and the courses for which waiver hours or credit are granted are listed

below. Waivers/credit granted for a specific course count toward the satisfaction of any requirement toward which the listed course counts.

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 150
Music Theory	4	MUS 120 & MUS 120L
Physics B—Physics (Introduction)	4	PHY 115
Physics C—Physics (Mechanical)	4	PHY 200
Psychology	4	PSY 101

International Baccalaureate (IB)

In general, three semester credit hours are waived for each Higher Level subject in which a score of five or greater was earned in the last 10 years. The IB courses and scores listed below are eligible for waiver hours at the Institute.

COURSE & LEVEL	SCORE
English (A1 & A2) - HL	5, 6, 7

College-Level Examination Program (CLEP)

There are two types of CLEP examinations: General and Subject. The Institute grants credit or course waivers for Subject Examinations only, and credit will be given only in those areas in which comparable courses are offered at the Institute. Courses waived or transferred are entered on students' transcripts, but no grades or quality points are awarded. These exams may not be repeated. Examination must be taken prior to the student's completion of a total of 40 hours of college credit, and official results must be sent to the Registrar's Office. CLEP offers a number of subject-matter examinations. Students obtaining the percentiles established by the mathematics, computer science, and humanities and social sciences departments will receive credit toward those basic requirements. Students wishing credit in courses other than those listed above should consult the appropriate departmental chair. The Institute will grant credit to students who pass the CLEP Subject Examinations approved by the department appropriate to the examination. The score necessary to receive credit through a Subject Examination will be the mean score achieved by C students in the national norms sample. The appropriate department will determine the number of course credits to be given for passing a Subject Examination. Students should check with the College Board at www.collegeboard.org for further details and information concerning test centers and dates.

Transfer Credit

Credit earned by examination at other colleges or universities in the last 10 years may be transferred, provided such credit meets the guidelines used by the Institute. For undergraduate programs, a student must take a minimum of 75% of the entire program at the Institute (unless the student attended an institution with which the Institute has established an articulation agreement.

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

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

1. The courses(s) offered for transfer must be taken at a bona fide, legitimate institution recognized and approved by a regulatory authority which oversees the educational system in the country where the institution is located. These courses must appear on official transcripts from the institution. The final decision regarding the transferability of credits remains at the Institute's discretion.

2. The course(s) must be comparable in academic quality to the Institute courses; transfer credit will be denied for courses not meeting this standard. Accordingly, current students are strongly urged to seek transfer approval from their advisor and the Registrar using the form provided for this purpose prior to enrollment in any course for which transfer approval might be sought.

3. Transfer credit will be considered for courses in which the grade of "B-" (or 2.7 quality points) or better is recorded.

4. Courses transferred to a student's major may also require a validation examination in order to be accepted.

5. "Credit" or "Pass" grades will not be accepted for transfer.

If a course is accepted for credit, it will be counted as a transfer credit. No grade points from such transfer courses will be calculated in the Institute grade point average. However, grades transferred for courses taken in residence at institutions with which the Institute has direct, formal institutional exchange agreements are exempt from this policy and will be recorded. Credit hours from another institution that are accepted towards the student's educational program must count as both attempted and completed hours. Courses transferred in may not be used to substitute improved grades for passing grades earned at the Institute.

Transfer Credits for Diploma Graduates from Local Polytechnics

The Institute and SIT entered into collaboration on March 2010 to offer an admission pathway for graduates with related diplomas from the five local polytechnics, namely:

- Nanyang Polytechnic
- Ngee Ann Polytechnic
- Republic Polytechnic

- Singapore Polytechnic
- Temasek Polytechnic

Students should refer to the SIT website at *www.singaporetech.edu.sg* for information on related diplomas.

Under this collaboration, students may transfer certain credits for courses that they have successfully completed at their respective polytechnics.

The Institute will communicate to these students their respective course sequences after taking into consideration the approved transfer credits. Students will also be informed of any other necessary bridging courses and/or additional electives that they need to successfully complete in order to meet the requirements to graduate with a degree from the Institute.

Any clarifications on course sequences for graduates from these polytechnics under the SIT collaboration scheme should be directed to the Registrar at the Institute.

Articulation Agreements

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

Credit Evaluation Forms

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

Transferability of Credits to Other Institutions

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

Granting Credits for Work Experience

The Institute does not grant credit for work experience.

Intercampus Transfer Policy

Intercampus Transfers are students who have enrolled in a DigiPen degree program and wish to permanently transfer to another DigiPen campus. Students who intend to complete an intercampus transfer should first meet with their current campus Registrar's Office to request official transcripts and to discuss the transfer requirements. Then the student should submit a completed Application for Campus Transfer to the Admissions Office for the campus to which they wish to

transfer. This application should include the application form, an essay on why they wish to transfer, as well as a completed transfer checklist. Students who wish to transfer should start the process as early as possible to allow enough time for materials transfer and preparing appropriate visa paperwork. Applications must be submitted by the following deadlines:

TRANSFER SEMESTER	DEADLINE
Fall	April 1
Spring	July 1

Applications submitted after the deadline will still be considered but it is not guaranteed that the approval will be completed in time. Students will be notified by the Admissions Office of the transfer campus whether the applications are approved or denied.

Students are eligible to apply for intercampus transfers anytime after matriculation and prior to the completion of the 75% of the entire programs in which they enrolled. A minimum cumulative GPA of 2.0 is required for intercampus transfer. In order to earn an undergraduate degree from the DigiPen campus to which students wish to transfer, the following conditions must be satisfied (in addition to the program and graduation requirements):

1. Students should complete a minimum of twenty-five percent (25%) of the credits required for the undergraduate degree program at the DigiPen campus awarding the degree;

2. At a minimum, students must maintain matriculated status for at least one academic year and complete the final semester at the campus awarding the degree.

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

Standards of Progress

Semester Credit Hour

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

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

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

In addition, each semester credit also assumes:

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

A classroom contact hour is 53 minutes in length. Whenever "semester hour" is used in this Catalog, it is synonymous with "semester credit hour" (SCH) and does not always represent "hours per week in class."

Grading System

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

GRADE	DESCRIPTION	QUALITY POINTS	EXPLANATION OF MINIMUM GRADE REQUIREMENT
A	Excellent	4.0	
A-	Excellent	3.7	
B+	Good	3.3	
B	Good	3.0	
B-	Good	2.7	
C+	Fair	2.3	
C	Fair	2.0	
C-	Fair	1.7	minimum grade required to earn credit for undergraduate students to earn credit
D	Poor	1.0	minimum grade required for undergraduate students to earn credit in non-core courses for their majors
F	Failure	0	

The following grades do not affect the GPA:

AU - AUDIT

Indicates that the student attended the course without expectation of credit or grade.

IP - IN PROGRESS

Indicates that the grade was not available from the instructor at the time the transcript was printed.

I - INCOMPLETE

This grade is used when circumstances beyond a student's control prohibit the student from taking the final exam or completing course work. It is not a grade given to students who need to retake a course because the student has fallen substantially behind. Students will not be given an "I" grade for unacceptable reasons, including, but not limited to, the need to rewrite a paper, the demands of a time-consuming job, the desire to leave town for a vacation or family gathering, the desire to do well on tests in other courses, etc. Students who want to repeat a course can drop it prior to the end of the eighth week of classes, and they will receive a "W" (see "Withdrawal" below). Otherwise, the instructor will assign the appropriate final grade ("D" [or 1.0 quality points] or "F," [or 0 quality points] for example).

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

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

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

W - WITHDRAWAL

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

P - PASS

Given for internship, seminar, and thesis courses.

Assessment Process

The Institute has an assessment process to evaluate the defined student learning outcomes of the education and training and established competencies. This process includes a combination of methods such as grading, portfolio assessment, projects, externships, and criterion referenced testing based on developed and appropriate rubrics.

Each course syllabus contains clearly defined course objectives and learning outcomes, course requirements, grading policy and allotment, and grading distribution. Students are made aware of the grading policy, performance standards, and grading distribution at the beginning of each course. The faculty measures the student's achievement of the stated course objectives and learning outcomes based on the grading policy published in the course syllabus.

Grade Reports

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

Grade Point Average

The academic standing of each student is determined on the basis of the grade point average (GPA) earned each semester. The GPA is determined by using the quality points assigned to each course grade a student earns. The quality point value for each grade earned during a semester is multiplied by the number of credit hours assigned to that course as listed elsewhere in this catalog. The sum of these points is the total number of quality points earned during the semester. This sum is divided by the number of credit hours attempted (hours from courses with grades of "A" [or 4.0 quality points] through "F" [or 0 quality points]) to obtain the GPA.

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

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

COURSE	CREDITS	GRADE	POINTS
CS 115	3	A	12.0 (3 x 4.0)
A-	1	3.7	
B+	Good	3.3	
B	Good	3.0	
B-	Good	2.7	
C+	Fair	2.3	
C	Fair	2.0	
C-	Fair	1.7	minimum grade required to earn credit for undergraduate students to earn credit

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

Satisfactory Academic Progress

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

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

CHANGING MAJORS AND SATISFACTORY ACADEMIC PROGRESS (SAP)

All courses that are deemed transferable to a student's new degree program are considered when calculating a student's satisfactory progress (SAP). Courses that are not part of the new major are not used.

Students should refer to the section Change of Major and Graduation for information about how to change majors.

UNDERGRADUATE STUDENTS

A student must be in "good academic standing" based on the cumulative grade point average of all courses taken at DigiPen Institute of Technology Singapore to meet the qualitative standard. Good academic standing is as follows:

STUDENTS WHO BEGAN IN THE 2011 COHORT OR EARLIER

MILESTONE—UNDERGRADUATE	MINIMUM GPA REQUIREMENT
• Up to 50% of program • 77 attempted credits* for BS in Computer Science in Real-Time Interactive Simulation, or BS in Computer Science and Game Design • 72 attempted credits for BFA in Digital Art and Animation • 73 attempted credits for BA in Game Design	1.8 or better cumulative GPA
• Over 50% of program • 78–153 attempted credits for BS in Computer Science in Real-Time Interactive Simulation, or BS in Computer Science and Game Design • 73–143 attempted credits for BFA in Digital Art and Animation • 74–146 attempted credits for BA in Game Design	2.0 or better cumulative GPA
• 100% of program • 154 earned credits or greater for BS in Computer Science in Real-Time Interactive Simulation, or BS in Computer Science and Game Design • 144 earned credits or greater for BFA in Digital Art and Animation • 147 earned credits or greater for BA in Game Design	2.0 or better cumulative GPA

STUDENTS IN COHORTS THAT BEGAN IN 2011 OR LATER

MILESTONE—UNDERGRADUATE	MINIMUM GPA REQUIREMENT
• Up to 50% of program • 77 attempted credits* for BS in Computer Science in Real-Time Interactive Simulation, or BS in Computer Science and Game Design • 73 attempted credits for BFA in Digital Art and Animation • 73 attempted credits for BA in Game Design	1.8 or better cumulative GPA
• Over 50% of program • 78–153 attempted credits for BS in Computer Science in Real-Time Interactive Simulation, or BS in Computer Science and Game Design • 74–144 attempted credits for BFA in Digital Art and Animation • 74–146 attempted credits for BA in Game Design	2.0 or better cumulative GPA
• 100% of program • 154 earned credits or greater for BS in Computer Science in Real-Time Interactive Simulation, or BS in Computer Science and Game Design • 145 earned credits or greater for BFA in Digital Art and Animation • 147 earned credits or greater for BA in Game Design	2.0 or better cumulative GPA

An attempted credit is defined as any credit that is awarded a final letter grade ("A" to "F"). Credits earning a "W" or "I" are not considered attempted credits for the purpose of calculating GPA. Credits earning a "W" or "I" are considered attempted credits for the purpose of calculating pace.

Appeals

Appeals involving extenuating circumstances may be addressed to the Student Affairs Office for action and resolution.

Passing Classes and Graduation

All students must have a cumulative GPA of at least 2.0 to graduate.

Academic Warning

Any student who fails to maintain the required minimum cumulative Grade Point Average (GPA) or who fail to complete their academic program within the maximum attempted credits allowed will be placed on Academic Warning.

FAILING TO MEET MINIMUM GPA REQUIREMENT

Any student who fails to maintain the required minimum cumulative GPA will be placed on Academic Warning the semester following the one where their cumulative GPA falls below the minimum required GPA. Students are removed from Academic Warning as soon as their cumulative GPA is above the minimum required GPA. Students who earn a 2.0 during their probationary semester but do not raise their cumulative GPA above the minimum requirement will continue Academic Warning until their cumulative average meets the minimum requirement.

While on Academic Warning, students will be restricted to a maximum course load of 15 credits of which 50% must be core courses as defined in the course catalog.

Probationary students must achieve a GPA of 2.0 or higher during their probationary semester. Failure to satisfy these requirements will result in academic expulsion, and expelled students must wait 12 months before they can reapply for admission.

FAILING TO COMPLETE PROGRAM WITHIN THE MAXIMUM TIME FRAME

Students who fail to complete their degree program within the maximum time frame, as defined under the Satisfactory Progress Policy, will be placed on Academic Warning to direct them towards completion. Working with their academic advisor, these students will develop a program completion plan that outlines the quickest path to completion. These students will be held to the same conditions as outlined above, with the exception that the maximum credit load per semester is waived.

Grade Changes and Appeals

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

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

Repeating Courses

Students may repeat any course in which they did not receive a passing grade (below a "C-" i[or 1.7 quality points] n a core course, below a "D" [or 1.0 quality points] in a non-core course), as long as they are in good standing with the Institute and eligible to continue their studies. All grades and attempted classes remain on a student's transcript. However, only the grades earned in the two most recent attempts of a course are calculated in a student's GPA. Courses in which a student has earned a passing grade may be repeated as audit courses only.

Course Overload

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

Attendance

Students more than 15 minutes late to class will be marked as absent for that entire class. Students may not leave class early without instructor permission. Students absent from all classes without explanation for a period of two consecutive weeks or more are considered to have withdrawn from the Institute as of their last date of attendance.

Withdrawing from Individual Classes

To withdraw from individual classes, a student must submit a drop request through the Student Record System (SRS).

Withdrawing from the Institute

To formally withdraw from the Institute, a student must submit a completed Withdrawal Notice Form to the Registrar's Office. Withdrawal Notice Forms may be downloaded from the Student Record System (SRS).

Upon withdrawing from the Institute, the student shall immediately return all materials in his or her possession relating to the program, whether created by the student or other students, or provided by the Institute.

Hardship Withdrawal

Students may seek a hardship withdrawal when one of three conditions prevents a student from completing all courses: death of a close family member, catastrophic illness in the family, or injury or illness that incapacitates the student.

Hardship withdrawals may be sought any time after the last date to withdraw from classes, as listed in the Academic

Calendar, but not after all materials for a course have been completed (i.e., after submitting the final exam or final assignment). The Hardship Withdrawal Form, a personal statement, and appropriate documentation (i.e., death certificate, obituary, letter from a state-licensed physician or mental health professional) must be provided to support all requests to the Student Affairs Office.

Once all documents are received, the Student Affairs Office will forward the documents to the Hardship Withdrawal Review Committee. If the committee grants a hardship withdrawal, the student will receive "W" grades in all classes and is ineligible to receive a grade or an "I" in any class in that semester. The student will be withdrawn from the Institute, effective his or her last day of attendance. Students seeking readmission must abide by the Institute's readmission policy.

The "W" Grade

If a student withdraws from individual classes or the Institute, please note:

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

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

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

Please refer to SIT student handbook for information on withdrawal from SIT.

Dean's Honor List Requirements

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

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

1. You must be matriculated.

2. You must be registered full-time in credit-bearing courses.

3. Full-time students must complete 12 or more credits in one semester.

4. Only passing grades (4.0 [or "A,"] 3.0 [or "B,"] 2.0 [or "C,"] and 1.0 [or "D"]) in credit-bearing courses are counted for eligibility.

5. No failing grades: a grade of "F" (or 0 quality points) in any course makes the student ineligible, regardless of other grades.

6. Minimum GPA of 3.5 is required.

7. Any courses that do not count towards the degree are excluded.

8. AP, Internship, and Independent Study credits are excluded.

9. Pass/Fail credits are NOT to be counted when calculating qualifying credits.

10. Incomplete grades will be evaluated after they are made up. The student must have qualified for the Dean's Honor List before and after the Incomplete grade was made up.

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

Process for Grievances and Appeals

CONCERNS OVER ACADEMIC STANDING

Students who would like to file an appeal against a decision regarding their academic standing in a particular course should discuss the matter with their instructor. If a satisfactory resolution is unattainable, students may file an appeal with the head of the department for that course. If the resultant solution is still unsatisfactory, then students may file an appeal with the Dean of Faculty and Academic Affairs. Students may appeal grades and review exams no later than two weeks after final grades are published. Academic records will be kept indefinitely.

Students who feel that they have any other type of dispute with the Institute, he/she should file a complaint with the relevant Department Chair or supervisor. A copy of this complaint shall be given to those involved with the dispute. If the Student is not satisfied with the decision of the Department Chair, a second complaint may be filed to the Chief Operating Officer – International. If the student is still dissatisfied with the decision, the student may appeal to the President of the Institute. If the student remains unsatisfied with the decision, he/she may appeal to the Executive Director of the Washington Student Achievement Council at:

Washington Student Achievement Council
P.O. Box 43430
Olympia, WA 98504-3430

OTHER DISPUTES

Schools accredited by the Accrediting Commission of Career Schools and Colleges must have a procedure and operational plan for handling student complaints. If a student does not feel that the school has adequately addressed a complaint or concern, the student may consider contacting the Accrediting Commission. All complaints reviewed by the Commission must be in written form and should grant permission for the Commission to forward a copy of the complaint to the school for a response. This can be accomplished by filing the ACCSC Complaint Form. The complainant(s) will be kept informed as to the status of the complaint as well as the final resolution by the Commission. Please direct all inquiries to:

Accrediting Commission of Career Schools and Colleges
2101 Wilson Boulevard
Suite 302
Arlington, VA 22201
Tel: (703) 247-4212
accsc.org

A copy of the Commission's Complaint Form is available at the Institute and may be obtained by contacting Caroline Tan Hui Hui, Student Relations Officer. If you are unsure of whom to speak to regarding a complaint, please contact Caroline Tan

Hui Hui at the following address:

Caroline Tan Hui Hui
Student Relations Officer
DigiPen Institute of Technology Singapore
Pixel Building @ one-north
10 Central Exchange Green, #01-01
Singapore 138649
Telephone: +65 6577 1900
Email: *catan@digipen.edu*

Transcripts

If a student's financial obligation is not fulfilled, the Institute is authorized to do the following until the owed monies are paid: withhold the release of the student's academic records or any information based upon the records, and withhold the issue of the student's transcripts. Students who have any questions regarding this matter should contact the Registrar's Office at +65 6577 1900.

To request an official transcript, students should complete a transcript request form (available online or from the Administration office) and either mail or fax it to the Registrar's Office. Requests are usually processed within five to seven business days. Unofficial grade reports can be viewed or printed anytime using the Student Record System (SRS) online.

Exams

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

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

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

Student Internships

Overview of Internships

Student internships are monitored, on-site work or service experiences for which students earn credit. Juniors and seniors 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, paid or unpaid. They can vary in duration and location, but must be approved in advance by the Institute.

Objectives of Internship Programs

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

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

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

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

Change of Major and Graduation

Requesting a Change of Major

Students wishing to change their major are encouraged to speak with their academic advisor before submitting an application. To apply for a change of major, the following steps must be completed:

1. Submit a Request for Change of Major Form to the Admissions Office; forms are available in front office or through the Student Record System (SRS). Admissions will print an unofficial grade report to include with the change of major application.

2. Submit a Change of Major Statement addressing the following topics:

   » Discuss your reasons for requesting a change of major, and explain how these reasons relate to your future goals (personal, educational, and professional).

   » Describe how a change of major will affect your academic plan from this point forward, and include any steps you will take to ensure a smooth transition.

3. Submit any additional materials required for the degree program to which you would like to change.

Art portfolios should be submitted in hard copy or electronic format, as originals will not be returned.

Once all relevant materials have been received and the application has been evaluated, a decision regarding the change of major will be sent to the student via mail or email. Students approved for a change of major will be emailed an Enrollment Agreement corresponding to the new program. They must sign this agreement either electronically through DocuSign or print, sign and return it to the Admissions Office before the change can take effect. In addition, students need to contact SIT's admission department to undertake the necessary process stipulated by SIT.

IMPORTANT INFORMATION REGARDING CHANGE OF MAJOR REQUESTS

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

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

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

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

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

Graduation Requirements

Degrees will be granted at the end of the semester in which students complete the final requirements. For example, if a student receives an "I" grade in a course required for graduation in his or her final semester, he or she will not graduate until the semester in which the "I" is replaced by a letter grade. During that semester, the student must reapply for graduation. A program of study must be completed within a reasonable period of time for a student to be eligible for graduation. The Institute defines "reasonable time" as the credit hours attempted cannot exceed 1.5 times the credit hours required to complete the program. Full-time students who do not complete their studies during this maximum time frame will be placed on academic warning and will have to complete their program requirements under the conditions of their academic warning. For more information, please see the section on "Academic Warning."

Applying for Graduation

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

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

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

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

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

Graduation Application Process

GRADUATION DATE	GRADUATION APPLICATION DUE DATE
April	December 1
July	April 1
December	April 1

1. The student completes the Graduation Application and submits the S$214.00 (inclusive of 7% GST) graduation fee by the deadlines stated above.

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

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

Student Affairs

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

- Academic Advising
- Academic Support Center
- Alumni Services
- Campus Life
- Career Services
- Counseling Helplines
- Disability Support Services
- International Student Services
- Student Activities & Organization
- Student Programs
  - First-Year Seminar
  - Graduation
  - New Student Orientation

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

Student Advising

The Institute has adopted a faculty advisor model to provide academic and career-related advising for students. Each student is assigned a full-time faculty member as an academic advisor. Advisors provide answers to academic questions, approve extra classes, and perform degree audits and other administrative functions. Students meet with their advisor during new student orientation and are encouraged to meet with their advisors at any time during their education. Advisors are instructed to follow up with advisees once a semester, especially during class registration time. Students are required to seek advisor approval for academic status changes, such as changing majors or applying for graduation.

Academic Support Center

Peer tutoring is available for 100 and 200 level courses in the Academic Support Center. For further information please contact *studentaffairs.sg@digipen.edu.*

Placement Assistance

Advice on career options is available to enrolled students. With the assistance of Student Affairs and faculty members, the Student Affairs office works to establish relationships with prospective employers on an on-going basis. It offers resume and job-hunting workshops to supplement career education found in the curriculum.

The Institute uses a job portal to post current job openings in the industry. The Institute also provides placement services in the form of internships that may be available during the summer; the placement program bases its recommendations of students on their academic performance. Additionally, the

Institute hosts an annual career fair that attracts employers from around the country to the campus to review student portfolios and conduct interviews. The Institute also attends industry events, such as the Game Developer's Conference, to promote the Institute's programs and its students. Placement assistance continues beyond graduation as these services are extended to alumni. For further information, please contact the Student Affairs office. Please note that employment upon graduation is not guaranteed.

Disability Support Services

DigiPen Institute of Technology Singapore strives to ensure that all students are provided with an equal opportunity to participate in the college's programs, courses, and activities. Students requiring special assistance must self-identify to the Student Affairs office and provide current documentation supporting their disability. Students must assist in identifying the proper accommodations and negotiate these accommodations at the beginning of each semester. The Institute will provide reasonable accommodations and academic adjustments as long as provisions do not fundamentally alter the nature of the programs or the academic requirements that are considered essential to the program of study.

Graduate Follow Up

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

Overseas Immersion Program

As required by the collaboration with Singapore Institute of Technology, DigiPen Institute of Technology Singapore operates an overseas exchange program, named as "Overseas Immersion Program," for all DigiPen – SIT students to attend a particular phase of the Institute's baccalaureate degree programs of study (as defined by the Program Directors) at the main campus, DigiPen Institute of Technology, located at Redmond, Washington, USA.

The Overseas Immersion Program is designed to allow DigiPen Institute of Technology Singapore's students to acquire overseas learning and immersion experience at the main campus, which would enrich their baccalaureate programs of study. All DigiPen – SIT students should complete this program at their own expenses. For more information, please refer to the SIT's website at *www. singaporetech.edu.sg* and the Institute's website at *www.singapore.digipen.edu.*

Educational Rights and Privacy of Student Records

DigiPen Institute of Technology Singapore reserves certain rights for students with respect to their education records. These rights are:

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

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

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

Release of Student Academic and Financial Records

If a student's parent, guardian, family member, or other individual wishes to obtain any of the student's information (including but not limited to account balance, tuition payments due, class registration, etc.), the student must fill out and submit the Student Consent for Release of Records Form listing the names of the individuals to whom his or her information may be released. This form will be distributed to all new students prior to matriculation. It can also be obtained online through the Student Records System.

Release of Student Directory Information

The following information is considered public or directory information and may be released to anyone unless a student informs the Registrar's Office that he or she does not wish any information released:

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

"NO" to Release of Information

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

Change from "NO" to "YES"

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

Regulation of Conduct and Disciplinary Procedures

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

Rules and Regulations

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

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

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

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

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

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

   - Religious content
   - Religious symbols
   - Pornographic material
   - Excessive violence
   - Sexual and nude content

- Promotion of illegal substances
- Promotion of racism or hate
- Content demeaning to any group of society

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

8. 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, he or she 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.

9. 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.

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

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

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

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

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

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

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

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

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

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

20. In accordance with applicable law, the Institute prohibits sexual harassment and harassment between employees, between students, and between employees and students. Harassment due to race, sex, color, national origin, ancestry, religion, physical or mental disability, veteran status, age, or any other basis protected by federal, state, or local law may violate the law and will not be tolerated. The Institute's policy prohibits inappropriate conduct even though it may not reach the legal standard for harassment.

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

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

Penalties

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

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

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

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

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

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

6. Expulsion from the Institute

7. Legal action against the student committing the offense.

Warnings

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

2. Charges filed under the law of the Republic of Singapore and/or the commencement of legal proceedings do not preclude disciplinary measures taken by the Institute.

Procedures

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

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

Dismissal by the Institute

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

Appeals

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

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

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

Degree Programs for the Academic Year 2014–2015

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

Program Overview

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

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

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

- Are graphics-oriented simulations, including 2D and 3D simulations.

- Can realistically reproduce or simulate natural phenomena and real-life events. Flight simulators are excellent examples of such simulations.

- Are highly interactive, requiring an elaborate and efficient graphical user interface (GUI). The development of a GUI requires the management of windows, menus, dialog boxes, and hardware resources including keyboards, mice, and display monitors.

- React in real time. The implementation of such simulations requires a thorough knowledge of computer hardware and computer languages.

- Are story-based simulations requiring a plot in which game objects must interact intelligently with each other. Therefore, in order to make games challenging and interesting, students must design and implement good artificial intelligence algorithms, which serve as the cognitive processes for the computer-controlled game objects.

- Could be designed for either a single-player or multi-player environment. The development of the latter requires the understanding of subjects such as computer networks, TCP/IP, and Internet programming.

- Are excellent examples of large and complex productions. Teamwork is essential to the successful completion of such productions. Therefore, students are divided into teams and are rigorously trained in object-oriented programming languages, paradigms, and software engineering techniques and practices.

Graduates of this degree program will be prepared to enter the video game industry as entry-level computer scientists and software engineers. Possible entry-level position titles include computer scientist, software engineer, software developer, software development engineer, software development engineer in test, software analyst, computer programmer, gameplay programmer, engine programmer, physics programmer, graphics programmer, networking programmer, artificial intelligence programmer, user interface programmer, tools programmer, web programmer, or game scripter. After many years in the industry, graduates may attain titles such as lead engineer, lead developer, development manager, principal engineer, technical director, and chief technology officer. This degree program also includes secondary training that can contribute directly to a graduate obtaining positions with titles such as producer, program manager, technical program manager, technical designer, and technical writer.

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

Degree Requirements

NUMBER OF CREDITS AND GPA

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

GRADE REQUIREMENTS AND CORE COURSES

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

ART AND MUSIC REQUIREMENTS

Students are required to take 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 REQUIREMENTS

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

ELECTIVES REQUIREMENTS

At least eight credits from any courses in any departments at DigiPen Institute of Technology Singapore. (Total: 8 credits)

HUMANITIES AND SOCIAL SCIENCES REQUIREMENTS

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

MATHEMATICS REQUIREMENTS

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

PHYSICS REQUIREMENTS

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

PROJECTS REQUIREMENTS

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

NOTE ON GENERAL EDUCATION COURSES

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

RECOMMENDED COURSE SEQUENCE CHART

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	CS 100	Computer Environment	X	4
	CS 120	High-Level Programming I—The C Programming Language	X	3
	CS 120L	High-Level Programming I Lab	X	1
	ENG 110	Composition		3
	GAM 100	Project Introduction	X	3
	MAT 140	Linear Algebra and Geometry	X	4
	Semester Total			18
Semester 2	COM 150	Interpersonal and Work Communication	X	3
	CS 170	High-Level Programming II—The C++ Programming Language	X	3
	CS 170L	High-Level Programming II Lab	X	1
	CS 230	Game Implementation Techniques	X	3
	GAM 150	Project I	X	3
	MAT 150 or MAT 180	Calculus and Analytic Geometry I or Vector Calculus I	X	4
	Semester Total			17
Semester 3	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
	MAT 200 or MAT 230	Calculus and Analytic Geometry II or Vector Calculus II	X	4
	PHY 200	Motion Dynamics	X	3
	Semester Total			20
Semester 4	CS 250	Computer Graphics II	X	3
	CS 280	Data Structures	X	3
	CS 365	Software Engineering	X	3
	GAM 250	Project II	X	4
	MAT 250	Linear Algebra	X	3
	PHY 250	Waves, Optics, and Aerodynamics		3
	Semester Total			19

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	CG 130	3D Computer Animation Production I		3
	CS 260	Computer Networks I, Interprocess Communication	X	3
	CS 300	Advanced Computer Graphics I	X	3
	CS 330	Algorithm Analysis	X	3
	GAM 300	Project III	X	5
	MAT 258	Discrete Mathematics	X	3
	Semester Total			20
Semester 6	COL 499	Career Search Preparation: Materials, Logistics and Communication	X	1
	CS 315	Low-Level Programming	X	3
	CS 350	Advanced Computer Graphics II	X	3
	GAM 350	Project III	X	5
	MAT 300	Curves and Surfaces	X	3
	Computer Science or Physics Elective	Any 200-level or higher CS course not required or PHY 350	X	3
	Elective	An elective of the student's choice from any department at DigiPen Institute of Technology Singapore		3
	Semester Total			21
Semester 7	ART 210	Art Appreciation		2
	GAM 400	Project IV	X	5
	Art & Music Elective	Select one: ANI 125, ART 400, ART 410, FLM 115, FLM 151, FLM 152, or MUS 115		2–3
	Computer Science or Physics Elective	Any 200-level or higher CS course not required or PHY 350	X	3
	Elective	An elective of the student's choice from any department at DigiPen Institute of Technology Singapore		3
	English Elective	One English elective chosen from any ENG course, ENG 116 and above		2–4
	Math Elective	MAT 256 or any MAT course greater than 300	X	3
	Semester Total			20–23
Semester 8	GAM 450	Project IV	X	5
	Computer Science or Physics Elective	Any 200-level or higher CS course not required or PHY 350	X	3
	Computer Science or Physics Elective	Any 200-level or higher CS course not required or PHY 350	X	3
	Elective	An elective of the student's choice from any department at DigiPen Institute of Technology Singapore		3
	English Elective	One English elective chosen from any ENG course, ENG 116 and above		2–4
	HSS Elective	One humanities & social science elective from any three-credit HIS, PSY or SOS courses		3
	Semester Total			19–21
Degree Total				154 minimum

Bachelor of Science in Computer Science and Game Design

Program Overview

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

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

Graduates of this degree program will be prepared to enter the video game industry as entry-level software engineers and game designers. Possible entry-level position titles include software engineer, software developer, software development engineer, software development engineer in test, software analyst, computer programmer, gameplay programmer, artificial intelligence programmer, user interface programmer, tools programmer, game scripter, technical designer, system designer, level designer, content designer, encounter designer, and game designer. This degree program also includes secondary training that can contribute directly to a graduate obtaining positions with titles such as producer, program manager, technical writer, and technical program manager. After many years in the industry, graduates may obtain titles such as lead engineer, lead designer, technical director, creative director, and director.

Degree Requirements

NUMBER OF CREDITS AND GPA

The BS in Computer Science and Game Design requires completion of at least 154 semester credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of 15 weeks each, or four academic years.

GRADE REQUIREMENTS AND CORE COURSES

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

ART REQUIREMENTS

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

COMPUTER SCIENCE REQUIREMENTS

The following courses are required: CS 100, CS 120, CS 120L, CS 170, CS 170L, CS 180, CS 225, CS230, CS 251, CS 280, CS 311, CS 330, and CS 380. (Total: 36 credits)

DESIGN REQUIREMENTS

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

ELECTIVES REQUIREMENTS

At least six credits from any courses in any departments at DigiPen Institute of Technology Singapore. (Total: 6 credits)

HUMANITIES AND SOCIAL SCIENCE REQUIREMENTS

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

MATHEMATICS REQUIREMENTS

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 REQUIREMENTS

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

PROJECTS REQUIREMENTS

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

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), ENG 120 (3), MAT 140 (4), MAT 150 or MAT 180 (4), MAT 200 or MAT 230 (4), MAT 258 (3), PHY 200 (3), PSY 101 (3), and one Humanities and Social Sciences elective (3), for a total of 33 credits.

RECOMMENDED COURSE SEQUENCE CHART

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	CS 100	Computer Environment	X	4
	CS 120	High-Level Programming I—The C Programming Language	X	3
	CS 120L	High-Level Programming I Lab	X	1
	GAM 100	Project Introduction	X	3
	GAT 110	Game History	X	3
	GAT 120	Game Analysis	X	2
	MAT 140	Linear Algebra and Geometry	X	4
	Semester Total			20
Semester 2	CS 170	High-Level Programming II—The C++ Programming Language	X	3
	CS 170L	High-Level Programming II Lab	X	1
	CS 230	Game Implementation Techniques	X	3
	ENG 110	Composition	X	3
	GAM 150	Project I	X	3
	GAT 210	Game Mechanics I	X	3
	MAT 150 or MAT 180	Calculus and Analytic Geometry I or Vector Calculus I	X	4
	Semester Total			20
Semester 3	CS 225	Advanced C/C++	X	3
	GAM 200	Project II	X	4
	GAT 211	Game Mechanics II	X	3
	GAT 240	Technology for Designers	X	3
	MAT 200 or MAT 230	Calculus and Analytic Geometry II or Vector Calculus II	X	4
	PHY 200	Motion Dynamics	X	3
	Semester Total			20
Semester 4	ART 105	Art Processes	X	3
	COM 150	Interpersonal and Work Communication	X	3
	CS 180	Operating System I, Man-Machine Interface	X	3
	CS 280	Data Structures	X	3
	GAM 250	Project II	X	4
	GAT 250	2D Game Design I	X	3
	Semester Total			19

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	ART 260	Graphic Design, User Experience, and Input	X	3
	CS 251	Introduction to Computer Graphics	X	3
	CS 380	Artificial Intelligence for Games	X	3
	GAM 302	Project III for Designers	X	5
	GAT 251	2D Game Design II	X	3
	PSY 101	Introduction to Psychology	X	3
	Semester Total			20
Semester 6	ART 310	Architectural Spaces, Design, and Lighting I	X	3
	CG 102	2D Raster and Vector Graphics for Designers	X	3
	CG 125	Introduction to 3D Production for Designers	X	3
	GAM 352	Project III for Designers	X	5
	GAT 315	3D Game Design I	X	3
	MAT 258	Discrete Mathematics	X	3
	Semester Total			20
Semester 7	CS 311	Introduction to Databases	X	3
	CS 330	Algorithm Analysis	X	3
	GAM 400	Project IV	X	5
	GAT 316	3D Game Design II	X	3
	MAT 340 or MAT 364	Probability and Statistics or Combinatorial Game Theory	X	3
	Design Elective	Any three-credit course with the GAT designation	X	3
	Semester Total			20
Semester 8	COL 499	Career Search Preparation: Materials, Logistics and Communication	X	1
	GAM 450	Project IV	X	5
	General Elective	An elective of the student's choice from any department at DigiPen Institute of Technology Singapore		3
	General Elective	An elective of the student's choice from any department at DigiPen Institute of Technology Singapore		3
	HSS Elective	Any three-credit COM, ENG, ECN, HIS, LAW, PHL, PSY, or SOS course	X	3
	Semester Total			15
Degree Total				154 minimum

Bachelor of Fine Arts in Digital Art and Animation

Program Overview

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

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

The broad scope of these demands presents a series of significant academic challenges. Most art students enter collegiate training with little or no substantial background knowledge relative to this field. Many secondary schools have been forced to cut back on the level of arts training that they are able to provide. Consequently aspiring artists must acquire this foundation while they are also trying to establish their professional focus. The complexity of the individual components of this field demand highly structured curricula and programmed sequencing simply to enable most students to be successful. Some students are capable of the rapid assimilation of the integrated knowledge the studios now require, but most are better served by a deeper and more sequential approach to the material.

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

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

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

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

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

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

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

This degree prepares a graduating student for a career in digital art and digital 3D animation, digital 2D animation, and video game or animation pre-production. Some of the careers for which graduates of the BFA in Digital Art and Animation are trained include Props and Environment Modelers, Texture Artists, Level Designers, Character Modelers, Character Riggers, Character Animators, 3D Lighting and Camera Design, Effects Animator, Conceptual Illustration and Character Design, and Storyboard Artists.

Degree Requirements

NUMBER OF CREDITS AND GPA

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

GRADE REQUIREMENT AND CORE COURSES

Certain non-elective courses which are part of the DigiPen BFA in Digital Art and Animation course sequence are survey or introductory courses intended to widen the student's understanding and educational experience but are additional to, not central to the degree. These courses (SOS 115, PHY 115, CS 115, and LAW 115) are all 100 level courses which are not taught during the first year of the degree program. As such they are considered to be non-core classes and the grading protocols for non-core courses apply (i.e., credit is given if the class is passed with a grade of "D" or better). All other courses, required or elective, are core courses and students must receive a grade of "C-" or higher to pass.

ANIMATION REQUIREMENTS

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

ART REQUIREMENTS

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

COMPUTER GRAPHICS REQUIREMENTS

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

ELECTIVE REQUIREMENTS

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

FILM REQUIREMENTS

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

HUMANITIES AND SOCIAL SCIENCE REQUIREMENTS

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

PROJECTS REQUIREMENTS

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

SCIENCE REQUIREMENTS

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

NOTE ON GENERAL EDUCATION COURSES

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

RECOMMENDED COURSE SEQUENCE CHART

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	ANI 101	Introduction to Animation—Theories and Techniques I	X	3
	ART 101	The Language of Drawing	X	3
	ART 110	Fundamentals of Visual Communication and Design Process	X	3
	ART 115	Art and Technology	X	4
	ENG 116	Storytelling	X	4
	FLM 115	History of Film and Animation	X	3
	Semester Total			20
Semester 2	ANI 125	Acting for Animation	X	3
	ANI 151	Advanced Animation—Theories and Techniques II	X	3
	ART 125	Tone, Color, and Composition	X	3
	ART 151	Basic Life Drawing	X	3
	BIO 150	Human Muscular, Skeletal, and Kinetic Anatomy	X	3
	FLM 151	Visual Language and Film Analysis	X	3
	Semester Total			18
Semester 3	ART 201	Advanced Life Drawing	X	3
	BIO 200	Animal Muscular, Skeletal, and Kinetic Anatomy	X	3
	CG 201	2D Raster Graphics and Animation	X	3
	CG 225	Introduction to 3D Animation	X	3
	PRJ 201	2D Animation Production	X	5
	Semester Total			17
Semester 4	ART 251	Character Design	X	3
	ART 350	Storyboards		3
	CG 251 or Elective	2D Vector Animation Production or **any course from the Elective Requirements list	X	3
	CG 275	3D Character Animation	X	3
	FLM 201 or FLM 210	Cinematography or Cinematography for Visual Effects	X	3
	PRJ 251	2D Vector Animation	X	5
	Semester Total			20

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

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

**Note: Please refer to the Elective Requirements.

Bachelor of Arts in Game Design

Program Overview

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

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

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

Degree Requirements

NUMBER OF CREDITS & GPA

The Bachelor of Arts in Game Design requires completion of at least 153 semester credits with a cumulative GPA of 2.0 or better. The program usually spans eight semesters of 15 weeks each, or four academic years.

GRADE REQUIREMENTS ARTS AND CORE COURSES

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

HUMANITIES AND SOCIAL SCIENCE REQUIREMENTS

The following courses are required: COL 499, COM 150, ENG 110, ENG 120, ECN 100, PSY 101, and PSY 201. Three additional credits must be selected from other courses with the designation COM, ENG, ECN, HIS, LAW, PHL, PSY, or SOS. (Total: 22 credits)

ART REQUIREMENTS

The following courses are required: ART 101 or ART 102, ART 125 or ART 126, ART 260, ART 310, CG 102 or CG 201, CG 125 or CG 225, and FLM 151. (Total: 24 credits)

MUSIC REQUIREMENT

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

DESIGN REQUIREMENTS

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

PROJECT REQUIREMENTS

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

MATHEMATICS REQUIREMENTS

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

SCIENCE REQUIREMENTS

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

COMPUTER SCIENCE REQUIREMENTS

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

ADVANCED ELECTIVES

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

GENERAL ELECTIVES

At least six credits from any courses in any departments at DigiPen Institute of Technology Singapore. (Total: 6 credits)

NOTE ON GENERAL EDUCATION COURSES

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

RECOMMENDED COURSE SEQUENCE CHART

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 1	CS 116	Introduction to Computer Technology and Programming	X	4
	GAM 100	Project Introduction	X	3
	GAT 110	Game History	X	3
	GAT 120	Game Analysis	X	2
	MAT 100	Pre-Calculus with Linear Algebra and Geometry	X	4
	PSY 101	Introduction to Psychology	X	3
	Semester Total			19
Semester 2	ART 102	Fundamentals of Visual Expression	X	3
	CS 175	Scripting Languages	X	3
	ENG 110	Composition	X	3
	GAM 152	Project I for Designers	X	3
	GAT 210	Game Mechanics I	X	3
	MAT 105	Introductory Probability and Statistics	X	3
	PHY 115	Introduction to Applied Math and Physics	X	3
	Semester Total			21
Semester 3	ART 126	Principles of Composition and Design	X	3
	CS 176	Advanced Scripting	X	3
	GAM 205	Project II for Designers	X	4
	GAT 211	Game Mechanics II	X	3
	GAT 240	Technology for Designers	X	3
	PSY 201	Cognitive Psychology	X	3
	Semester Total			19
Semester 4	CG 102	2D Raster Graphics and Animation for Designers	X	3
	CG 125	Introduction to 3D Production for Designers	X	3
	COM 150	Interpersonal and Work Communication	X	3
	ENG 120	Research, Reasoning, and Writing	X	3
	GAM 255	Project II for Designers	X	4
	GAT 250	2D Game Design I	X	3
	Semester Total			19

SEMESTER	COURSE	COURSE TITLE	CORE	CREDITS
Semester 5	ART 260	Graphic Design, User Experience, and Input	X	3
	FLM 151	Visual Language and Film Analysis	X	3
	GAM 302	Project III for Designers	X	5
	GAT 251	2D Game Design II	X	3
	MUS 115	Fundamentals of Music and Sound Design	X	3
	Advanced Elective	A 200 level or higher elective of the student's choice from any department at DigiPen Institute of Technology Singapore	X	3
	Semester Total			20
Semester 6	ART 310	Architectural Spaces, Design, and Lighting I	X	3
	ECN 100	Introduction to Economics	X	3
	GAM 352	Project III for Designers	X	5
	GAT 212	Advanced Game Mechanics	X	3
	GAT 315	3D Game Design I	X	3
	Advanced Elective	A 200 level or higher elective of the student's choice from any department at DigiPen Institute of Technology Singapore	X	3
	Semester Total			20
Semester 7	GAM 400	Project IV	X	5
	GAT 316	3D Game Design II	X	3
	GAT 330	Interactive Narrative and Character Creation for Games	X	3
	Advanced Elective	A 200 level or higher elective of the student's choice from any department at DigiPen Institute of Technology Singapore	X	3
	General Elective	An elective of the student's choice from any department at DigiPen Institute of Technology Singapore		3
	Semester Total			17
Semester 8	COL 499	Career Search Preparation: Materials, Logistics and Communication	X	1
	GAM 450	Project IV	X	5
	MGT 451	Project Management	X	3
	Design Elective	Any three-credit course with the GAT designation	X	3
	General Elective	An elective of the student's choice from any department at DigiPen Institute of Technology Singapore		3
	HSS Elective	Any three-credit course from the Department of Humanities and Social Sciences offered at DigiPen Institute of Technology Singapore	X	3
	Semester Total			18
Degree Total				153 minimum

Minors

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

- Minor in Art

- Minor in Electrical and Computer Engineering

- Minor in English

- Minor in Game Design

- Minor in Mathematics

- Minor in Physics

Art Minor

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

- ART 101 and ART 125.

- Choice of two of the following courses: ART 151, ART 201, CG 201, or ART 225.

- Choice of ART 300 or ART 310.

- ART 401 or other 400-level ART course (except ART 400).

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

English Minor

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

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

To earn an English minor, students must complete a minimum of 18 credits in ENG courses with a "C-" (or 1.7 quality points) or better. Except for ENG 450, all ENG courses count toward the English minor. Students must also take at least one upper-division ENG course numbered 300 or above.

Game Design Minor

To earn a game design minor at DigiPen, students must complete a block of 15 credits satisfying the following:

- Five of the following courses: GAT 110, GAT 210, GAT 211, GAT 212, GAT 250, GAT 251, GAT 305, GAT 310, GAT 315, GAT 316, GAT 330, GAT 335, GAT 405.

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

Mathematics Minor

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

- The courses are taken from MAT 140 or higher (any MAT course excluding MAT 103).

- 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 better.

Course Descriptions for the Academic Year 2014–2015

Department of Animation and Production

Animation Courses

ANI 101 Introduction to Animation—Theories and Techniques I (3 Cr.)
Prerequisite(s): None

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

ANI 125 Acting for Animation (3 Cr.)
Prerequisite(s): None

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

ANI 151 Advanced Animation—Theories and Techniques II (3 Cr.)
Prerequisite(s): ANI 101

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

ANI 300 Acting Through an Interface (3 Cr.)
Prerequisite(s): ANI 125, ANI 151, & CG 275

An animator's ability to express attitude, thought, and emotion through a surrogate is a fundamental skill of 3D character animation. This course builds upon the earlier acting and 2D animation curriculum. It explores 3D character animation techniques of performance, physicality and weight. Students complete a number of animation assignments during the semester.

ANI 301 Physicality and Pantomime in CG Animation (3 Cr.)
Prerequisite(s): ANI 125, ANI 151, ART 201, ART 226, CG 275

Students in this course will be expected to take the information and experience they have learned in ANI 101 and ANI 151 and develop those principles further. Here students will create a catalogue of movement and dynamic expression. They will explore a full range of action in depth and dimension, paying special attention to gestured movement and timed performance. They will learn that the pose is everything and that the movement from pose to pose in three-dimensional space can help heighten and dramatize performance. In this class students will not only deepen their understanding of performance animation but also a mastery of performance in time and space. (3-hour lecture)

ANI 350 Voice Acting for Animation (3 Cr.)
Prerequisite(s): ANI 300

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

ANI 399 Special Topics in Art (3 Cr.)
Prerequisite(s): PRJ 251

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

ANI 400 Cinematic Animation (3 Cr.)
Prerequisite(s): ANI 350, ART 401, MUS 115

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

ANI 450 Advanced Animation Portfolio (3 Cr.)
Prerequisite(s): ANI 350, CG 300, & PRJ 350

This class requires students to further extend their portfolio work, principally polishing and refining elements that will align them well for current industry needs. With a generous selection of assignment opportunities to be explored, students gain advanced instruction on more focused 'acting', 'physicality', and 'creature' animation. This class provides students with an ideal opportunity to improve an area of their portfolio work that will better represent animated 'body mechanics' and 'acting' skills.

Film Courses

FLM 115 **History of Film and Animation** (3 Cr.)
Prerequisite(s): None

This course examines the more than 100-year history of film and animation. Beginning with the scientific and technical advances that made these media technologies possible, students explore every major movement and genre as well as their impact on society. The course gives students critical vocabulary required for explaining story, animation and cinematic techniques.

FLM 151 **Visual Language and Film Analysis** (3 Cr.)
Prerequisite(s): None

Animation is ultimately "film making," and animators should learn from the many classics on how to effectively bring various film production elements together. Students review several films and study how the relationships between scripts, cameras, lighting, sets, production design, sound, acting, costumes, props, directing, and production lead to successful visual stories. They also examine the fundamental theories underlying visual storytelling. Understanding the creative processes utilized by these influential filmmakers provides insight into how students may improve their own animations.

FLM 152 **Introduction to Visual Storytelling** (3 Cr.)
Prerequisite(s): None

Students will review films and study how the relationships between scripts, cameras, lighting, sets, production design, sound, acting, costumes, props, directing, and production lead to successful visual stories. They will also examine the fundamental theories underlying visual storytelling. Ultimately, students will gain insight into effective cinematic sequences. Not for BFA in Digital Art and Animation, BA in Game Design and BS in Computer Science and Game Design students.

FLM 201 **Cinematography** (3 Cr.)
Prerequisite(s): FLM 151

Like a filmmaker, computer animators must have a good understanding of appropriate camera composition, lighting and editing techniques to enhance the visual impact of the story being told. Appropriate composition and camera movement help to reveal action, and lighting establishes focus, place, and mood.. Assignments in camera composition, movement, lighting and editing help students solidify their understanding of the concepts presented.

FLM 210 **Cinematography for Visual Effects** (3 Cr.)
Prerequisite(s): FLM 151

This course focuses on the technical aspects of cinematography including understanding how cameras work, how images are captured and processed, computer graphics theory, and image analysis. Emphasis is on digital imagery.

FLM 215 **Visual Effects Analysis and Process** (3 Cr.)
Prerequisite(s): FLM 151

This course explores the history of visual effects in film and how the craft has developed in terms of technology and processes. Students also examine the fundamental production pipeline for the planning and execution of visual effects.

FLM 250 **Digital Post-Production** (3 Cr.)
Prerequisite(s): FLM 151

The last step of any animation project involves the assembly of various production elements ranging from rendered files to sound effects. This is also the stage where the visual effects artists add the effects seen in today's movies. This course teaches the fundamental skills these artists use in post-production. Effective editing skills are the primary outcome of the course. Students will also cover the planning, execution, and addition of special effects to animation.

FLM 275 **Fundamentals of Music and Sound Design** (3 Cr.)
Prerequisite(s): None

Every good animation relies on a well-designed soundtrack to enhance the production. While most animators do not produce the soundtrack themselves, they need to understand the effect of music, voice, and sound effects on an audience. Animators must be able to communicate their ideas to a musician and understand the technological possibilities of modern sound design. Initially students survey a broad range of music from different cultures. Emphasis is on developing basic listening skills in hearing rhythm, melody, harmony, color, texture, and form. Students then learn how to apply this to the production needs of animation. The course gives special attention to the generation of sound, how to use sound to advance a story, and how it can create mood, a sense of place, and emphasis.

There may be course fees associated with this class. Please see the course registration packet for details.

FLM 350 **Compositing I** (3 Cr.)
Prerequisite(s): CG 201, FLM 210, & FLM 215

This course introduces students to two key areas of compositing—image preparation (e.g., rotoscoping, blue/green screen, masks, wire removal) and compositing software (layer-based, node-based). Students apply this knowledge to basic 2D compositing, as well as motion tracking and color correction.

FLM 360 **Compositing II** (3 Cr.)
Prerequisite(s): CG 275 & FLM 350

This advanced compositing course focuses on the integration of 3D elements into live action footage. Concepts covered include image stabilization, lighting, green screen setup and shooting, match moving, camera tracking, and body tracking

Projects Courses

PRJ 201 **2D Animation Production** (5 Cr.)
Prerequisite(s): ANI 151 & ART 125

This is a traditional animation course within the context of a two-semester project. This project builds on the cumulative skill sets acquired in ANI 101 and ANI 151, but with a focus on team dynamics, acting, visual storytelling, and the goal of completing a short animated film rather than a series of learning exercises. PRJ 201 concentrates on pre-production for the project.

PRJ 251 **2D Vector Animation Production** (5 Cr.)
Prerequisite(s): PRJ 201

This is a traditional animation course within the context of a two-semester project. This project builds on the cumulative skill sets acquired in ANI 101 and ANI 151, but with a focus on team dynamics, acting, visual storytelling, and the goal of completing a short animated film rather than a series of learning exercises. Building on the work completed in PRJ201, PRJ251 concentrates on the production and animation for the project.

PRJ 300 **Limited-Scope 3D Production** (5 Cr.)
Prerequisite(s): CG 275 & PRJ 251

PRJ 300 addresses two of the more serious affective learning challenges facing commercial animators: professional focus and realistic expectations. The goal of this course is to build on the experience gained in production pipeline procedures in PRJ 201/251 as well as the modeling and animation skills developed in CG 225 and CG 275. Students apply skills learned concurrently in ART 300 and CG 300 to produce an animated short film of limited duration.

PRJ 350 **3D Animation Production** (5 Cr.)
Prerequisite(s): ART 300, CG 300, & PRJ 300

PRJ 350 picks up where PRJ 300 left off in further developing design and production skills. The course is a full-semester project where students will produce a short animated production that demonstrates their skills in design, modeling, animation, lighting and rendering.

PRJ 400 **Capstone Project I** (5 Cr.)
Prerequisite(s): ART 350, ENG 116, PRJ 350, & Senior class standing

Working effectively as producers, the animation faculty team will select, from student submissions, one or more team projects to be produced. They then assign students to specific teams, based upon their artistic strengths and career goals. Wherever possible, individual students are introduced to specialist advisers from outside the faculty.

Each student's individual effort is assessed as well as the overall teamwork and professional success of the team. As in a professional work environment, student teams are not allowed to exclude individual members due to production conflicts or performance. The faculty alone retains the right to remove a team member for failure to perform.

PRJ 450 **Capstone Project II** (5 Cr.)
Prerequisite(s): ART 401, PRJ 400, & Senior class standing

Having completed the pre-production work for a team-based animated production in PRJ 400, students then complete final rendering and post-production. Students face the challenges of commercial art direction, quality control, production deadlines, and team dynamics, as well as many technical challenges.

INT 390/450 **Internship I/II** (5 Cr.)
Prerequisite(s): Permission of Instructor

An internship is any carefully monitored work or service experience in which an individual has intentional learning goals and reflects actively on what she or he is learning throughout the experience. It is usually a professional activity under general supervision of an experienced professional and in a job situation, which places a high degree of responsibility on the student. Internships are well structured along the Internship Guidelines available in the Administration Office.

Department of Computer Science

Computer Science Courses

CS 100 **Computer Environment** (4 Cr.)
Concurrent Course(s): CS 100L

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

CS 101 **Introduction to Computer Environment** (1 Cr.)
Prerequisite(s): None

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

CS 115 **Introduction to Scripting and Programming** (3 Cr.)
Prerequisite(s): None

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

CS 116 **Introduction to Computer Technology and Programming** (4 Cr.)
Prerequisite(s): None

This class introduces programming environments to students who are not enrolled in a science degree program at DigiPen. The course provides students with an introductory overview of the fundamental elements on which computers are based, including basic computer hardware systems, operations, and structures. An introduction to basic programming includes simple logic, programming flow, loops, variables, and arrays. Conditionals, evaluations, and other control structures are also included. The instructor may cover special topics in programming or scripting and may focus on currently popular scripting languages in the video game industry.

CS 120 **High-level Programming I—The C Programming Language** (3 Cr.)
Concurrent Course(s): CS 120L

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

CS 120L **High-level Programming I Lab** (1 Cr.)
Concurrent Course(s): CS 120

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

CS 170 **High-level Programming II—The C++ Programming Language** (3 Cr.)
Prerequisite(s): CS 120 & CS 120L
Concurrent Course(s): CS 170L

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

CS 170L **High-level Programming II Lab** (1 Cr.)
Concurrent Course(s): CS 170

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

CS 175 **Scripting Languages** (3 Cr.)
Prerequisite(s): CS 116 or CS 120 & CS 120L

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

CS 176 **Advanced Scripting** (3 Cr.)
Prerequisite(s): CS 170 & CS 170L, or CS 175

This course presents game implementation techniques and game architecture in a scripting language environment. Students investigate concepts of game architecture, such as game-system component separation and game flow while learning about essential elements such as the game state manager, input/output handler, and frame rate controller. Students learn how to create several different types of classic games in a variety of scripting languages most commonly used for professional games, learning the specific syntax and approaches of each language in the process. As part of their implementation, students learn how to use the specific graphics, audio interface, physics and math APIs found in the scripting environments used. Students survey concepts in space partitioning, particle systems, map editors and other elements so that they are capable of creating working prototypes of 2D games.

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

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

CS 200 **Computer Graphics I** (3 Cr.)
Prerequisite(s): CS 170 & CS 170L, & MAT 140

CS 200 presents fundamental mathematical elements, data structures, and algorithms useful for animating and viewing 2D primitives. The course aims to fulfill two objectives. The first objective is to provide students with a sufficient mathematical and algorithmic background to design and implement 2D graphics applications. The second objective is to prepare students with the knowledge required for writing 3D graphics applications. The first half of the course deals with scan-conversion algorithms for rasterizing 2D primitives such as lines, circles, ellipses, triangles, and arbitrary polygons. The second half of the course is concerned with the viewing and animation of these 2D primitives. The course covers topics such as interpolation techniques, transformations, culling, clipping, animation techniques, and the 2D viewing pipeline.

CS 225 **Advanced C/C++** (3 Cr.)
Prerequisite(s): CS 170 & CS 170L

This course builds on the foundation created in the first two High-level programming courses (CS 120/170). It presents advanced topics of the C/C++ programming language in greater detail. Such topics include advanced pointer manipulation, utilizing multi-dimensional arrays, complex declarations, and standard library functions. Advanced C++ topics include

class and function templates, operator overloading, multiple inheritance, runtime type information, the standard template library, and performance issues.

CS 230 **Game Implementation Techniques** (3 Cr.)
Prerequisite(s): CS 120 & CS 120L
Concurrent Course(s): CS 170

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

CS 245 **Introduction to Interactive Sound Synthesis** (3 Cr.)
Prerequisite(s): CS 170 & CS 170L, CS 180, MAT 140, & PHY 200

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

CS 246 **Advanced Sound Synthesis** (3 Cr.)
Prerequisite(s): CS 245

This course covers the basic building blocks that go into making a sound engine. Topics may include: audio file formats, sound card architecture, low-level sound APIs, high level sound APIs, streaming audio, mixing, digital filters and effects, 3D audio, audio spectra and the Fast Fourier Transform.

CS 250 **Computer Graphics II** (3 Cr.)
Prerequisite(s): CS 200

CS 250 examines the mathematical elements and algorithms used in the design and development of real-time 3D computer graphics applications, such as games, cockpit simulators, and architectural walk-throughs. 3D computer graphics involve drawing pictures of 3D objects, usually on a 2D screen. This process of generating a 2D image of a 3D graphics application can be described as a series of distinct operations performed on a set of input data. Each operation generates results for the successive one. This process is called the graphics-rendering pipeline, and it is the core of real-time computer graphics. The graphics pipeline can be conceptualized as consisting of

three stages: application, transformation, and rasterization. The course begins by introducing the 3D graphics pipeline. The application stage is examined from the viewpoint of the representation, modeling, and animation of 3D objects. Topics include user interaction, camera animation techniques, simulation of dynamic objects, and collision detection techniques. Next, the course examines the process of mapping 3D graphic objects from model-space to viewport coordinates. The transformation stage implements this process. Finally, the conversion of a geometric primitive in viewport coordinates into a 2D image is studied. The rasterization stage implements this final process.

CS 251 Introduction to Computer Graphics (3 Cr.)
Prerequisite(s): CS 170 & CS 170L

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

CS 260 Computer Networks I, Interprocess Communication (3 Cr.)
Prerequisite(s): CS 180 & CS 225

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

CS 261 Computer Networks II (3 Cr.)
Prerequisite(s): CS 260

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

CS 280 Data Structures (3 Cr.)
Prerequisite(s): CS 225

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

CS 300 Advanced Computer Graphics I (3 Cr.)
Prerequisite(s): CS 250

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

CS 311 Introduction to Databases (3 Cr.)
Prerequisite(s): CS 170 & CS 170L

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

CS 315 Low-level Programming (3 Cr.)
Prerequisite(s): CS 100 & CS 100L, CS 120 & CS120L, & CS 180

This course introduces students to modern microprocessor architectures using x86 series for case studies. In this course, students are expected to write both assembly language programs and to use assembly language to optimize various C/C++ programs. Topics may include pipelining, superscalar/VLIW machines, register-renaming, out-of-order execution, multi-core architecture, caches, multicore-cache coherency, x86 instruction set architecture, application binary interfaces, Flynn's taxonomy, and Streaming SIMD extensions.

CS 330 Algorithm Analysis (3 Cr.)
Prerequisite(s): CS 225, CS 280, & MAT 200 or MAT 230

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

CS 350 Advanced Computer Graphics II (3 Cr.)
Prerequisite(s): CS 300

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

CS 365 Software Engineering (3 Cr.)
Prerequisite(s): CS 225

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

CS 370 Computer Imaging (3 Cr.)
Prerequisite(s): CS 280

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

CS 380 Artificial Intelligence for Games (3 Cr.)
Prerequisite(s): CS 225 & CS 280

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

CS 381 Machine Learning (3 Cr.)
Prerequisite(s): CS 280

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

CS 388 Introduction to Portable Game System Development (3 Cr.)
Prerequisite(s): CS 250 & GAM 250

This course introduces students to portable game systems programming and development, which is different from PC programming and development due to the embedded structure of the machine. Students work with a very limited amount of memory and CPU power. To overcome the system's memory limitations, several graphics techniques are used, such as tile based game objects and backgrounds using color palettes. As for the CPU limitations, fixed point decimal is used instead of float numbers, along with asynchronous operations. Several portable game system specific topics, such as managing multiple graphics engines simultaneously and handling the touch pad, are discussed.

CS 391 Code Analysis and Optimization (3 Cr.)
Prerequisite(s): CS 280 & CS 315

This course focuses on understanding the details of the computer, complier, and language, specifically how to apply these toward the practical problems of solving crashes and performance issues. The emphasis is not only on knowing what and why, but also on taking that knowledge and creating useful tools and techniques for solving these problems.

CS 399 Special Topics in Computer Science (3 Cr.)
Prerequisite(s): Permission of instructor

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

CS 420 Graphics File Format and Data Compression Techniques (3 Cr.)
Prerequisite(s): CS 250 & CS 280

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

CS 460 Advanced Animation and Modeling I (3 Cr.)
Prerequisite(s): CS 300, CG 130, & MAT 300

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

they learn a behavior-based technique, which generates motion that satisfies a set of rules, such as kinematics, physics, or other constraints.

CS 488 **Introduction to Console Development** (3 Cr.)
Prerequisite(s): GAM 250 & CS 250

This course introduces students to the game development process on a gaming console platform. It covers both the technical features and design considerations of console development. Topics covered include an overview of game console hardware and comparison with the PC environment, memory management, asynchronous data loading, graphics API, reading optical and motion sensor data, optimization, and NAND data management. As students learn the material, they work on a game project that takes advantage of the unique capabilities of gaming consoles.

Department of Digital Arts

Computer Graphics Courses

CG 102 **2D Raster and Vector Graphics for Designers** (3 Cr.)
Prerequisite(s): ART 126
Concurrent Course(s): CG 125

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

CG 125 **Introduction to 3D Production for Designers** (3 Cr.)
Prerequisite(s): ART 125 or ART 126
Concurrent Course(s): CG 102

This course introduces game design students to the current software and production process of 3D animation, with a focus on implementing the art assets into a game engine. The course begins with basic information, such as interface organization strategies, equipment options, and production elements. The class also introduces techniques for texture mapping, modeling, rigging, lighting, cameras, and animation. Additionally, it looks at basic interface customization options and strategies in 3D graphics, culminating in a series of applied problems in 3D production techniques.

CG 130 **3D Computer Animation Production I** (3 Cr.)
Prerequisite(s): None

This course introduces students to the basic theories and techniques of 3D computer animation. The curriculum emphasizes standard 3D modeling techniques, including polygonal and spline modeling, texture map creation and application, keyframing, and animating through forward kinematics and inverse kinematics. (Earlier catalogs listed this course as GAT 300.)

CG 135 **3D Computer Animation Production II** (3 Cr.)
Prerequisite(s): CG 130

This course builds on the fundamentals taught in CG 130. Students learn about key framing, special effects, final rendering, and recording. (Earlier catalogs listed this course as GAT 350.)

CG 201 **2D Raster Graphics and Animation** (3 Cr.)
Prerequisite(s): ANI 151, ART 101, & ART 125

This course introduces students to the industry-standard software and practices of raster graphics and animation. The course begins with basic information, such as interface organization strategies, system components, bit depth, resolution, memory management, and output strategies. It also

explores techniques and critical thinking skills for digital painting, scanning, still compositing, and texture creation. Additionally, it looks at basic interface customization options and strategies in 2D raster graphics.

CG 225 **Introduction to 3D Animation** (3 Cr.)
Prerequisite(s): ANI 151, ART 101, & ART 125

This course introduces students to industry-standard software and practices of 3D animation. The course begins with basic information such as interface organization strategies, equipment options, and production elements. It also introduces techniques and critical thinking skills for texture mapping, modeling, rigging, lighting, cameras, and animation. Additionally, it looks at basic interface customization options and strategies in 3D graphics, culminating in a series of applied problems in 3D production techniques

CG 251 **2D Vector Graphics and Animation** (3 Cr.)
Prerequisite(s): CG 201

This course examines the principles and practices of 2D vector graphics and animation. It introduces students to industry-standard software, output options, and production strategies for using vector graphics in both graphic design and animation. The course gives special consideration to critical thinking and refinement strategies when modifying vector images. Students examine methods of using vector-based tools for creating web and broadcast animation, and the course concludes with a series of applied problems in 2D vector animation.

CG 275 **3D Character Animation** (3 Cr.)
Prerequisite(s): CG 105 or CG 225

Students continue to explore and exercise the concepts and techniques of 3D animation through a series of assignments applied to characters. Exercises in this course are considerably more demanding than those completed in CG 125 as they are longer and require more refinement, subtlety, and creativity. The course emphasizes character development—the expression of personality, mood, thought, and attitude through motion and posing. It also gives special consideration to proper model rigging.

CG 300 **3D Environment and Level Design** (3 Cr.)
Prerequisite(s): CG 275

This course introduces students to the principles of 3D environment design. Theatrical sets, architectural simulations, and level design are considered. In order to provide students with a broader skill set, this course also presents the "mechanics" of how to use other 3D animation software, with an emphasis on the unique strengths of the package. Students explore the comparative strengths of different software packages and the impact that this has on workflow. The course emphasizes critical thinking skills and strategies for tool selection.

CG 301 **3D Environment Design for Games** (3 Cr.)
Prerequisite(s): ART 310, CG 102, & CG 125

This course provides game design students with an understanding of the design and production process of environments for 3D games. It introduces the principles of

3D environment creation and provides a functional working knowledge of modeling, texturing and lighting skills within the framework of a 3D modeling package to create believable and well-designed environments. Student work is implemented into a game engine.

CG 303 **Hard Surface Modeling and Texturing** (3 Cr.)
Prerequisite(s): CG 275

Building on the knowledge and skills for modeling taught in CG 275 "3D Character Animation," this course focuses on the process for optimized modeling and texturing of non-organic scene elements including architecture, props, and vehicles. Students are also introduced to digital sculpting for hard surface models.

CG 305 **Digital Sculpture** (3 Cr.)
Prerequisite(s): CG 275

This course introduces an array of digital modeling, sculpting, and painting techniques with a set of industry-standard 3D and 2D tools. After a series of exercises, students learn the tools and workflow of digital sculpting and enhance their knowledge of anatomy. As part of this class, students create a highly finished 3D character that is fully designed, modeled, posed, sculpted and textured. They also demonstrate knowledge of environmental sculpting.

CG 310 **Game Team Art Production I** (3 Cr.)
Prerequisite(s): CG 275

This course consists of the production of art for a game team. Students devise a production schedule at the beginning of the course. Evaluation of the art production comes from a faculty member who oversees the production milestones.

CG 311 **Game Team Art Production II** (3 Cr.)
Prerequisite(s): CG 310

This course is a continuation of CG 310, consisting of the production of art for a game team. Students devise a production schedule at the beginning of this course. Evaluation of the art production comes from a faculty member who oversees the production milestones.

CG 315 **Texturing for 3D** (3 Cr.)
Prerequisite(s): CG 201 & CG 275

This class focuses on how to generate efficient and accurate texture maps. Students explore techniques for generating landscape, architectural, object, and character based textures. Topics include: clamped textures, tileable textures, advanced methods for generating normal maps, z-depth, displacement, and emissive type textures. Students will explore UV mapping, unwrapping, multi-layered shaders, animated texturing methods, use of photo reference, manipulation, compositing and other techniques to create complex textures.

CG 320 **Materials and Textures** (3 Cr.)
Prerequisite(s): CG 175

This course builds on foundational knowledge from CG 175 and CG 102, delving further into the art and science of painting

textures for game characters and environments. Students focus on generating multiple maps for materials to define complex shader properties. Emphasis is placed on effective texture layout and detail for use in games and cinematic applications. Students are also trained on the use of digital sculpting tools that combines 3D/2.5D modeling, texturing, and painting.

CG 340 **Game Art Production Tools** (3 Cr.)
Prerequisite(s): CG 320

This course looks beyond 2D digital painting and 3D animation software to introduce students to specialized modeling, texturing, animation, and special effects tools.

CG 350 **Graphics for Gaming** (3 Cr.)
Prerequisite(s): CG 300

This course examines the unique problems of creating graphics for games, and it teaches effective production techniques for addressing these issues.

CG 360 **Light and Rendering** (3 Cr.)
Prerequisite(s): FLM 350

CG artists must develop strong lighting skills. This course looks at the subject through the world of film cinematography and covers the process of lighting both interior and exterior virtual environments. At the technical and artistic levels, students explore rendering techniques and strategies that efficiently produce a more convincing result.

CG 375 **Character Rigging** (3 Cr.)
Prerequisite(s): CG 275

This course exposes students to rigging techniques. All students will share models and texture sets and work on learning industry best practices for professional grade character rigs.

CG 399 **Special Topics in Computer Graphics** (3 Cr.)
Prerequisite(s): CG 275

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

CG 400 **Advanced 3D Modeling Techniques** (3 Cr.)
Prerequisite(s): CG 275

This course focuses on the design and production of highly detailed models for use in feature and broadcast animation. Students use a best-of-breed approach to define their tool set, with particular emphasis placed on organization and structure. Additional emphasis is placed on generating layered digital intermediate files for use in a model-composite workflow in a desktop production environment. Lectures also cover environment and character design research as relevant to detail modeling, presented in a framework of industry-standard geometries and methods. Students also explore advanced material creation using a global illumination-capable rendering engine, incorporating advanced texture creation techniques.

CG 410 **Effects Animation** (3 Cr.)
Prerequisite(s): CG 360 & FLM 360

This course explores the technical and creative elements required to rig and animate effects. Topics include animating particle effects, fluids, soft and rigid body dynamics. Students are required to integrate the various effects into a live-action shot.

Department of Fine Arts

Art Courses

ART 101 The Language of Drawing (3 Cr.)
Prerequisite(s): None
Credit may be received for either ART 101 or ART 102, not both.

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

ART 102 Fundamentals of Visual Expression (3 Cr.)
Prerequisite(s): None
Credit may be received for either ART 101 or ART 102, not both.

Students will be introduced to simple drawing techniques, constructed linear perspective, visual design methodology, and drawing vocabulary through lectures, studio assignments, and simple projects.

ART 105 Art Processes (3 Cr.)
Prerequisite(s): None

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

ART 110 Fundamentals of Visual Communication and Design Process (3 Cr.)
Prerequisite(s): None

Beginning with the physiology of perception, this course explores the simple building blocks of visual communications and how the viewer understands and responds to shapes, symbols and images. The foundational skills of design process and problem solving methodologies are explored to develop the student's visual problem solving skills.

ART 111 Introduction to Ceramics (3 Cr.)
Prerequisite(s): None

This course builds a foundation in ceramic arts. It provides the opportunity to learn basic techniques of the ceramic process, which include hand-building techniques, wheel throwing and glazing.

ART 115 Art and Technology (4 Cr.)
Prerequisite(s): None

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

ART 125 Tone, Color, and Composition (3 Cr.)
Prerequisite(s): ART 101
Credit may be received for either ART 125 or ART 126, not both.

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

ART 126 Principles of Composition & Design (3 Cr.)
Prerequisite(s): ART 101 or ART 102
Credit may be received either ART 125 or ART 126, not both

This course continues to build students' abilities to draw by exploring techniques for producing finished drawings, quick explanatory sketches, and rapid visualizations. Methods for use of tone and color to convey mood and atmosphere are covered. Basic graphic design and typography are taught with particular emphasis on interface design. Classical forms of compositional organization, such as symmetry, asymmetry, golden mean, and figure ground relationships, are also explored.

ART 151 Basic Life Drawing (3 Cr.)
Prerequisite(s): ART 101

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

ART 201 Advanced Life Drawing (3 Cr.)
Prerequisite(s): ART 125 & ART 151

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

sequential figurative composition.

ART 210 **Art Appreciation** (2 Cr.)
Prerequisite(s): None

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

ART 222 **Ceramics—Hand Building** (3 Cr.)
Prerequisite(s): ART 111

This course builds upon hand-building techniques learned in "Introduction to Ceramics". Surface texture techniques and basic mold making will be explored, all while working in the certainty of 3D.

ART 223 **Ceramics—Wheel Throwing** (3 Cr.)
Prerequisite(s): ART 111

This course focuses on building skills developed in "Introduction to Ceramics" to produce simple forms on the potter's wheel such as cylinders, bowls and plates.

ART 225 **3D Design and Sculpture** (3 Cr.)
Prerequisite(s): ART 201

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

ART 226 **Gesture Drawing for Animation** (3 Cr.)
Prerequisite(s): ART 101, ART 151, & BIO 150

In this class, the student is provided with significant time in front of live moving models. The main purpose of drawing moving models is to describe what the model is doing as opposed to what the form of the model is. All aspects of the drawing, including form, line, silhouette, details and most importantly, line of action, concentration on communicating visually what the model is doing and/or thinking. The course focuses on weight, depth, balance, tension, rhythm and flow.

ART 228 **Figurative Sculpture** (3 Cr.)
Prerequisite(s): ART 101 & BIO 150

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

ART 230 **Painting** (3 Cr.)
Prerequisite(s): ART 125

This course explores ideas and various techniques related to painting. The use of color and the representation of space are emphasized. Students explore masterworks, studio painting, and painting en plein aire. Technical and social problems related to painting are explored using portraiture, still life, and environment/landscape. A portable field easel and appropriate painting supplies will be required. The course will culminate in a group show of student projects.

ART 234 **Survey of Sequential Art** (3 Cr.)
Prerequisite(s): ART 125 or ART 151

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

ART 251 **Character Design** (3 Cr.)
Prerequisite(s): ART 201

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

ART 260 **Graphic Design, User Experience, and Input** (3 Cr.)
Prerequisite(s): None

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

ART 300 **Perspective, Backgrounds, and Layouts** (3 Cr.)
Prerequisite(s): None

This course explores the animation pre-production skills of

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

ART 301 Concept Art Resources (3 Cr.)
Prerequisite(s): ART 251, CG 201 & CG 275

This course builds upon all art disciplines, primarily 2D related skills, to prepare students for positions requiring the creation of concept art. Emphasis is placed on the importance of balancing speed of content generation with quality, as this is one of the most pressing and relevant challenges in this field. With this mindset, students are challenged to evaluate and understand new forms of character and environment generation. Both theory and technique are heavily stressed during this course, with the final tangible outcome being multiple portfolio pieces that demonstrate the individual's abilities and unique style/interests.

ART 310 Architectural Spaces, Design, and Lighting I (3 Cr.)
Prerequisite(s): None

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

ART 350 Storyboards (3 Cr.)
Prerequisite(s): ART 201, ENG 116, & FLM 151

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

ART 360 Architectural Spaces, Design, and Lighting II—Period Styles (3 Cr.)
Prerequisite(s): ART 310, CG 301, & CG 320

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

in order to research and analyze architectural styles and then to build them in the computer lab.

ART 399 Special Topics in Art (3 Cr.)
Prerequisite(s): ART 151

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

ART 400 Drawing Fundamentals (2 Cr.)
Prerequisite(s): None

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

ART 401 Conceptual Illustration and Visual Development (3 Cr.)
Prerequisite(s): ART 300

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

ART 405 Matte Painting (3 Cr.)
Prerequisite(s): ART 401

This course takes the student through the process of designing and painting (traditionally, digitally or both) backgrounds that can be seamlessly integrated with live action footage, animation, and games.

ART 410 Mechanical Drawing (3 Cr.)
Prerequisite(s): None

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

and prototyping.

ART 450 **Portfolio** (3 Cr.)
Prerequisite(s): PRJ 350

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

Department of Game Software Design and Production

Game Projects Courses

GAM 100 **Project Introduction** (3 Cr.)
Prerequisite(s): None

This class presents an overview of the way the game development industry works and a history of game development. It exposes students to the positions and job responsibilities that each member of a game development team has, along with the industry requirements for concept pitches, design documents and schedules. It also introduces sprite animation, object motion, and input processing, which students use in the creation of a game of their own design.

GAM 150 **Project I** (3 Cr.)
Prerequisite(s): CS 120 & CS 120L, & GAM 100
Credit may be received for either GAM 150 or GAM 152, but not for both.

This project focuses on the creation of a simple game or simulation. Students work together on teams of three or four members. All projects must be written entirely in C (C++ is not allowed) and cannot use external libraries or middleware of any kind (except those provided by the instructor). Topics include effective team communication, planning, documentation, debugging, source control, testing, and iterative software development techniques.

GAM 152 **Project I for Designers (3 Cr.)**
Prerequisite(s): CS 116 or CS 120 & CS 120L, GAM 100
Credit may be received for either GAM 150 or GAM 152, but not for both.

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

GAM 200 **Project II** (4 Cr.)
Prerequisite(s): CS 170 & CS 170L, CS 230, GAM 150, & MAT 140

This project is divided into two semesters and focuses on the creation of a simple real-time game or simulation with 2D graphics (3D games are not allowed). Students work together on teams of three or four members to implement technical features, such as audio effects, music playback, pattern movement, simple artificial intelligence, same-machine multiplayer (networking is not allowed), particle systems, scrolling, and simple physics. All projects must be written with a core of C++ code and cannot use middleware such as pre-existing physics engines, networking engines, etc. Additional topics may include basic software architecture, essential development practices, fundamentals of team dynamics, and task prioritization methods.

GAM 202 **Game Usability and Analysis** (1 Cr.)
Prerequisite(s): GAM 150 or GAM 152

This course focuses on assessing and analyzing the usability of games in development. Topics covered may include usability, testing roles, bug reports and regression, player psychology and observation, and measuring subjective experiences. Students run usability sessions as the basis to report on and analyze games from other project classes.

GAM 205 **Project II for Designers** (4 Cr.)
Prerequisite(s): CS 175, GAM 152, MAT 100
Credit may be received for either GAM 200 or GAM 205, not both.

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

GAM 250 **Project II** (4 Cr.)
Prerequisite(s): CS 225 & GAM 200

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

GAM 252 **Advanced Usability and Process** (1 Cr.)
Prerequisite(s): GAM 202

This course expands on the fundamentals of usability from GAM 202 and covers the full usability and testing process. Topics covered may include functional specifications, test cases, test coverage, build processes, prioritization methods, testing tools, automation, beta tests, internal vs. external testing, localization issues, and certification requirements. Students continue to run usability sessions and write reports on games from other project classes.

GAM 255 **Project II for Designers** (4 Cr.)
Prerequisite(s): CS 176, GAM 205
Credit may be received for either GAM 250 or GAM 255, not both.

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

GAM 300 **Project III** (5 Cr.)
Prerequisite(s): CS 200 or CS 251, CS 260 or CS 245 or CS 365, CS 280, GAM 250, PHY 200

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

GAM 302 **Project III for Designers** (5 Cr.)
Prerequisite(s): GAT 211, either GAM 250 or GAT 251 & GAM 252
Credit may be received for either GAM 300 or GAM 302, not both.

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

GAM 350 **Project III** (5 Cr.)
Prerequisite(s): GAM 300

In this class, students work to complete the projects they began in GAM 300. Additional topics may include large project software architecture, advanced testing techniques, internships, and an introduction to resumes and interviews.

GAM 352 **Project III for Designers** (5 Cr.)
Prerequisite(s): GAM 302
Credit may be received for either GAM 350 or GAM 352, not both.

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

GAM 375 **Advanced Project** (5 Cr.)
Prerequisite(s): GAM 350 or GAM 352

In this course, individual students work to create a highly polished advanced technology demonstration or design project. With instructor approval, students could instead polish an exceptional project from a previous class to a higher standard. Topics may include advanced user interfaces and controls, advanced special effects, advanced behaviors, and creating effective demonstrations.

GAM 390/490 **Internship I/II** (5 Cr.)
Prerequisite(s): GAM 250 or GAT 251

An internship is any carefully monitored work or service experience in which an individual has intentional learning goals and reflects actively on what she or he is learning throughout the experience. It is usually a professional activity under general supervision of an experienced professional and in a job situation, which places a high degree of responsibility on the student. Internships are structured along the Internship Guidelines available in the Administration Office.

GAM 400 **Project IV** (5 Cr.)
Prerequisite(s): GAM 350 & CS 250 or GAM 352 & GAT 251

This project is divided into two semesters and focuses on the creation of an innovative game, simulation, or demo. Students may use current software and hardware technologies with instructor approval, such as web technologies, gaming consoles, mobile devices, commercial physics engines, commercial game engines, hands-free input devices, etc. These technologies can be used to implement technical features, such as 3D animation, advanced lighting and rendering, advanced 3D physics, high-performance networking, and advanced AI algorithms. Innovation can also come from the design, visuals, and/or audio components of the project. Students work independently or in teams, as appropriate to the scope of their project. Additional topics may include advanced interviewing techniques and writing effective resumes.

GAM 450 **Project IV** (5 Cr.)
Prerequisite(s): GAM 400

In this class, students work to complete the projects they began in GAM 400. Additional topics may include working in the industry, personal networking, and career strategies.

Game Design and Development Courses

GAT 110 **Game History** (3 Cr.)
Prerequisite(s): None

This course covers the history of games from the very first games of ancient civilizations, to traditional tabletop games, to classic video games from the 20th century. Topics may include how the core mechanics of even the oldest games are still present in video games today, how games can be categorized by their core mechanics, and how social forces and technology drive changes in the games we play. Students are required to play, analyze, and modify a wide variety of games as the primary coursework of this class.

GAT 120 **Game Analysis** (2 Cr.)
Prerequisite(s): None

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

punishment, intensity curves, teaching the player, visual aesthetics, and aural aesthetics.

GAT 210 **Game Mechanics I** (3 Cr.)
Prerequisite(s): GAT 110, GAT 120

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

GAT 211 **Game Mechanics II** (3 Cr.)
Prerequisite(s): GAT 210

This course focuses on how to create the maps, characters, and combat systems needed for combat-oriented games. Students work to create a large variety of maps, create new character types for existing games, convert specific video games into tabletop games, and build a tabletop combat-oriented game of their own design. Topics may include map types and layouts, movement, visibility, force composition, character statistics and roles, melee combat, ranged combat, damage, armor and health.

GAT 212 **Advanced Game Mechanics** (3 Cr.)
Prerequisite(s): GAT 211

This course focuses on the design of non-digital role-playing games and a variety of non-digital simulation games. Students work to create an original small role-playing game, a simulation game of their choice, and an additional non-digital game of any kind. Topics may include skill systems, character advancement, equipment variety, realistic combat, strategic simulations, supply systems, economic simulations, vehicle simulations, and sport simulations.

GAT 240 **Technology for Designers** (3 Cr.)
Prerequisite(s): CS 170 or CS 175, MAT 100 or MAT 140

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

GAT 250 **2D Game Design I** (3 Cr.)
Prerequisite(s): GAT 210, PSY 101, and either CS 170 & CS 170L, or CS 175
Credit may be received for either GAT 250 or for GAT 305, but not for both.

This course focuses on designing and implementing games using a 2D engine. Students work to create several original games in common genres, such as platformers, shooters, brawlers, or puzzle games. Topics may include aesthetics, level construction, enemy placement, resource placement, player guidance, player controls, scripting, and game mechanics in 2D.

GAT 251 **2D Game Design II (3 Cr.)**
Prerequisite(s): GAT 250 & GAT 211

This course focuses on designing and implementing some of the more complicated types of 2D games, such as role-playing games, strategy games, or economic games. Students work to create several original games in these genres, including one in the genre of their choice. Topics may include character advancement, inventory, strategic balance, diplomacy, trading, and real-time economic systems.

GAT 315 **3D Game Design I** (3 Cr.)
Prerequisite(s): GAT 251
Credit may be received for either GAT 315 or for GAT 310, but not for both.

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

GAT 316 **3D Game Design II** (3 Cr.)
Prerequisite(s): ART 310, GAT 315

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

GAT 330 **Interactive Narrative and Character Creation for Games** (3 Cr.)
Prerequisite(s): ENG 110 & GAT 251

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

GAT 335 **Serious Games** (3 Cr.)
Prerequisite(s): GAM 250 or GAT 251

This course focuses on games and simulations that do not have entertainment as their primary purpose. Topics may include military training, medical training, employee training, skill training, safety training, emergency response training, educational games, advocacy games, therapeutic games, exercise games, scientific simulations, optimization simulations, and planning simulations.

GAT 399 **Special Topics in Game Development** (3 Cr.)
Prerequisite(s): Permission of instructor

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

GAT 401 **Rapid Prototyping** (3 Cr.)
Prerequisite(s): CS 225 or CS 176

This course introduces students to High-level tools for rapid prototyping of creative, interactive, multimedia experiences, using current technologies for making small, portable games. The design, development, and iterative processes commonly used for developing web-based game applications and other multimedia presentations are also covered.

GAT 405 **Advanced Game Design** (3 Cr.)
Prerequisite(s): GAT 251

This course focuses on one or more advanced game design topics based on the expertise of the instructor. Topics may include art games, music games, social games, educational games, serious games, handheld games, alternative input games, radically innovative games, and more. Students work to create one or more prototypes of a game in the areas being covered, either individually or in teams, as appropriate. Emphasis is heavily placed on innovation and students are encouraged to challenge their assumptions about what games are and what games can be.

GAT 480 **Senior Portfolio** (1 Cr.)
Prerequisite(s): GAM 350 or GAM 352

This one-credit course covers advanced portfolio development. Students work to organize and present their work in online, paper, and electronic media in a professional form. Topics may include targeted resumes, non-standard cover letters, advanced interviewing techniques, interactive portfolios, and voice-over videos.

MGT 451 **Project Management** (3 Cr.)
Prerequisite(s): None

This course provides in-depth examination of theories, techniques, and issues in project management. It covers various aspects of project management including team leadership, marketing, budgeting, long-range project planning, contract negotiations, and intellectual property considerations. The course includes exercises that give students insight into dealing with product conceptualization, team effectiveness and performance issues.

Department of Humanities and Social Sciences

College Success Courses

COL 499 **Career Search Preparation: Materials, Logistics, and Communication** (1 Cr.)
Prerequisite(s): None

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

Communications Courses

COM 150 **Interpersonal and Work Communication** (3 Cr.)
Prerequisite(s): ENG 110

Students explore how their culture, gender, economic status, age and other personal characteristics influence their work communications. The course explores verbal and non-verbal communication skills in a global work environment. Students learn written communication techniques most effective for use in the technology workplace. Additionally, students explore and practice negotiation skills, both internally and externally at their workplace.

COM 250 **Professional Communication** (3 Cr.)
Prerequisite(s): COM 150

This course is designed to prepare students for the communication challenges that await them in the professional world. Topics covered may include professional networking strategies, career search materials, self-presentation and interview skills, and effective communication across all levels and functions of the workplace.

COM 399 **Special Topics in Communication** (3 Cr.)
Prerequisite(s): Permission of Instructor

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

Economics Courses

ECN 100 **Introduction to Economics** (3 Cr.)
Prerequisite(s): None

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

ECN 350 **Engineering Economics** (3 Cr.)
Prerequisite(s): None

This course gives students a sound basis for making economic decisions in business and industry environments. Students learn how to decide which projects are worthwhile, determine priorities, and select components. Topics in this course include present worth, future amounts, cash flows, salvage value, depreciation, rates of return, income tax, basic cost accounting, and funding sources, including venture capital and SBIR. The course also covers the basics of intellectual property, patents, and copyright.

English Courses

ENG 110 **Composition** (3 Cr.)
Prerequisite(s): None

This course focuses on generating and discussing ideas for composition and engages in all stages of the writing process, with emphasis on the development and application of critical thinking skills. The primary focus of the course is developing the ability to construct, write, and revise argumentative/persuasive essays. Assignments may also include other types of writing, such as narrative, descriptive, and comparative essays.

ENG 116 **Storytelling** (4 Cr.)
Prerequisite(s): None

This course covers the principal elements of storytelling including theme, character, perspective, setting, plot, and dialogue. It encompasses both visual and non-visual media, such as short stories, novels, drama, and film. Through a series of creative writing exercises, students practice developing stories with both words and images.

ENG 120 **Research, Reasoning, and Writing** (3 Cr.)
Prerequisite(s): ENG 110

In this composition course, students practice advanced argumentative essay writing with a focus on research, critical analysis of the research, thesis presentation, and defense. During the semester students write several research essays on various topics using both traditional and new information technologies.

ENG 150 **Mythology** (3 Cr.)
Prerequisite(s): ENG 110 or ENG 116

This course studies myths from different world cultures. It provides an in-depth discussion of the Hero's Journey (a basic pattern that appears in many narratives) and its principal archetypes. It also studies mythology across the arts and examines how essential it is to the study of literature, drama, film and video games.

ENG 230 Speculative Fiction (3 Cr.)
Prerequisite(s): ENG 110 or ENG 116

This course is a survey of Speculative Fiction (in literature, television, film, and graphic novels) that moves beyond pure realism to include fantastic or imaginative elements and to present worlds that differ significantly from our own. Each semester, the course will focus on one or more sub-genres, which may include Science Fiction, Fantasy, Horror, Magic Realism, Alternate History, Steampunk, or Cyberpunk.

ENG 242 Multicultural Literature (3 Cr.)
Prerequisite(s): ENG 110 & ENG 150

This course explores what modernity and post-modernity have or have not meant to American writers whose histories and cultures are not European in origin but whose writings are steeped in European-American literary traditions. The course explores the cultural hybridism of this literature as well the unique visions of the world they have created. These funny, humorous, bitterly satirical, and downright serious (post-) modern fantasies are quintessentially American, yet also unique and peculiar to these authors' ethnic experiences. The selected works also offer an opportunity to read or re-read well established and newer American works of literature.

ENG 243 Epic Poetry (3 Cr.)
Prerequisite(s): ENG 110, ENG 116, or ENG 150

This course provides an introduction to the literary form of the epic poem. Students gain in-depth knowledge of the form and apply this experience by adapting the epic's themes and structures into their own creative endeavors, including video games. Students also produce an epic-based creative work as a final project in the course.

ENG 245 Introduction to Fiction Writing (3 Cr.)
Prerequisite(s): ENG 110 or ENG 116

This course provides an introduction to the study and practice of fiction writing including characterization, plot, setting and point of view. It presents selected works of short and long fiction. The course is an opportunity for students to practice their own creative writing skills. They are required to write at least two short stories.

ENG 246 American Ethnic Literatures (3 Cr.)
Prerequisite(s): ENG 110 or ENG 116

This course covers prominent themes and techniques in American ethnic literatures such as Native, African, Asian, and Hispanic American literatures. Modern texts are emphasized but pre- or early 20th century classics may also be included.

ENG 250 The Graphic Novel (3 Cr.)
Prerequisite(s): ENG 110 or ENG 116

This course provides an introduction to the study of graphic novels, a unique field of inquiry encompassing many world cultures and drawing on many disciplines. Students will read, discuss, and analyze many different types of novels, such as stand-along, serial, and adaptive books.

ENG 315 Story through Dialogue (4 Cr.)
Prerequisite(s): ENG 116 or ENG 245

This course introduces students to the basics of screenplay writing for film beginning with the fundamentals of dramatic structure, story arcs, character arcs, and dialogue. Through a series of related assignments, students experience the process of developing a script of their own and practice their hand at writing dialogue for film. Students will write at least one original pre-production script in screenplay format.

ENG 340 Creative Writing across the Arts (3 Cr.)
Prerequisite(s): ENG 110 or ENG 116

This course focuses on the generation of creative writing in multiple genres and media, including poetry, fiction, creative non-fiction, and graphic novels. Students study and practice writing in a workshop atmosphere and engage in intensive reading of excellent writings, most of which employ interdisciplinary, cross-genre approaches that encompass painting, photography, and other visual art. Discussions of readings are followed by writing experiments designed to spark original thinking, to develop facility with writing, and to enhance understanding of the creative process. Students gain in-depth knowledge of the possibilities of creative writing and apply this experience by writing both short creative pieces and longer works.

ENG 399 Special Topics in English (3 Cr.)
Prerequisite(s): Permission of instructor

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

ENG 400 Creative Writing for Game Design (3 Cr.)
Prerequisite(s): ENG 110 or ENG 150

This course focuses on the narrative elements of creative writing. Exercises generate thinking and hone students' basic storytelling talents, including characterization, exposition, plot, conflict, back-story, dialogue, and appropriate use of language. Students learn how to use symbols to design a story and how to manipulate the symbols to create character, plot, message, and interactivity. Students are encouraged to access their own genius, culture, and life experience in the development of their stories.

ENG 410 Interactive Storytelling (3 Cr.)
Prerequisite(s): ENG 110

In this class, students learn to design stories with symbolic language. Exercises help students apply and understand character design and development, archetypes, conflict, plot patterns, back-story, dialogue, exposition, premise, and the psychological dynamics of human choice. Students also learn how to manipulate symbols in images by drawing from a variety of theoretical models, such as Carl Jung's dream analysis, personality profiling per Myers-Briggs, Gestalt psychology, and narrative architecture.

ENG 420 Cybertexts: Interactive Media and the Future of Narrative (3 Cr.)
Prerequisite(s): ENG 110 or ENG 150, Equivalent, or Permission of instructor

Video games and other forms of interactive media are widely touted as the future of both popular entertainment and narrative storytelling. If video games and other interactive media are developing into art forms, then we can expect that these emerging narrative forms will be able to accommodate genres of storytelling that have existed since time immemorial, including romance, comedy, tragedy and epic. Yet the dynamics of nonlinear storytelling, the limits of current video game technology, and the constraints of the marketplace do not seem conducive to expanding the narrative elements of interactive media. This course traces the boundaries between narratives and games, and aims to identify areas of overlap that can lead to the development of new expressions of narrativity in interactive media. One central goal of the course is to grapple with the problem(s) posed by interactive narrative.

Assigned readings examine the difference between traditional narrative texts and texts that require a higher degree of interactivity, collectively called cybertexts. The goal of the course is to identify what differences may exist, and to analyze the possibilities for adapting traditional narrative into interactive media. This class's central innovation requires students to actively adapt an element of traditional narrative into a cybertext. By the end of the class, students reach a conclusion, based on their reading and course work, as to whether cybertexts can effectively encompass traditional narrative genres, and if not, whether this is due to limitations of the form, or the limitations of technology

ENG 440 Advanced Fiction Writing (3 Cr.)
Prerequisite(s): ENG 245, ENG 315, or ENG 340

This course builds upon the concepts and skills taught in previous writing courses. Advanced Fiction Writing offers students the opportunity to further develop their fiction-writing skills by engaging in intensive writing and regular critique of their peers' creative work. The emphasis is on refining narrative writing skills and developing individual style and voice. Students write three full-length short stories and read contemporary fiction by established authors not discussed in previous courses. Enrollment is limited to a maximum of 12 students. The limited class size will afford the intensive production schedule and frequent discussion of writing.

ENG 450 Elements of Media and Game Development (2 Cr.)
Prerequisite(s): None

Relative to modern technological media, the most important issue to consider is the nature of the interactive loop of influence between media and culture. Interactivity is one of the most powerful and important potentials of the game medium, but the term is often used with superficial understanding of its implications. This course emphasizes the nature of interactivity primarily from psychological and sociological perspectives. Students review and define interactive media using examples drawn from academic research, film, television, and games. Students have ample opportunity to contemplate and discuss how they can apply a more comprehensive understanding of interactivity in order to surpass the current limits of interactive media products.

History Courses

HIS 100 Introduction to World History I (3 Cr.)
Prerequisite(s): None

Covering a wide range of world history (Prehistoric to Middle Ages, Western and Asian Civilizations), this course provides an overview of events, civilizations, and cultures throughout time that form major historical shifts. Students analyze a series of case studies with particular focus on governments, technology, religion, and culture, and how clashes between these (and other) themes created changes in culture, power, and civilizations. Three major themes connect several topics discussed in this course with those explored in HIS 150: issues of authority and inequality within civilizations; encounters and conflicts between civilizations; and cultural and technological exchanges within and between civilizations.

HIS 150 Introduction to World History II (3 Cr.)
Prerequisite(s): HIS 100

This course continues the topics covered in HIS 100, covering from approximately 1650 A.D. until present day (Renaissance to present day, Western and Asian Civilizations). Students analyze a series of case studies with particular focus on governments, technology, religion, and culture, and how clashes between these (and other) themes created changes in culture, power, and civilizations. Three major themes connect several topics discussed in this course with those explored in HIS 100: issues of authority and inequality within civilizations; encounters and conflicts between civilizations; and cultural and technological exchanges within and between civilizations.

Japanese Courses

JPN 101 Introduction to Japanese I (3 Cr.)
Prerequisite(s): None

This course is designed for students with little or no background in Japanese. The course presents the basics of pronunciation, orthography, speaking, listening comprehension, reading, writing, and the sociolinguistics of modern Japanese. This course emphasizes acquiring the ability to communicate and function accurately and appropriately in both speaking and writing Japanese.

JPN 102 Japanese II (3 Cr.)
Prerequisite(s): JPN 101

This course is designed for students who have taken JPN 101. The pace of JPN 102 is slightly faster than JPN 101. JPN 102 emphasizes acquiring the ability to communicate and function in Japanese accurately and appropriately, both in speech and in writing. By the end of the course, students are able to speak, understand, read, and write Japanese on a limited variety of topics.

Law Courses

LAW 115 **Introduction to Intellectual Property and Contracts** (3 Cr.)
Prerequisite(s): None

The animation and computer software industries are founded upon the principle of intellectual property. This course introduces students to the social concepts and traditions that led to the idea of intellectual property. It surveys the various international legal systems governing intellectual property, giving special consideration to Title 17 and the local statutes that govern copyrights, trademarks, and patents in the United States. Students learn fundamental issues surrounding this field, such as fair use, international relations, and economics. The course also introduces students to a basic overview of contracts, including structure, traditions, and vocabulary.

Philosophy Courses

PHL 150 **Introduction to Philosophy** (3 Cr.)
Prerequisite(s): ENG 110

This course introduces some of the basic philosophical issues and questions related to everyday life. Topics include human nature (self, mind, consciousness, and freedom), values (ethics, morality, and aesthetics), knowledge (reasoning, rationality, and truth), philosophy of science (universe and origins of life), philosophical positions (naturalism, idealism, realism, pragmatism, and existentialism), and philosophy of religion (god(s) and religion). Students apply these concepts to the philosophical issues related to games and video games, specifically definitional issues, philosophical themes in games, and art in games, among others.

PHL 399 **Special Topics in Philosophy** (3 Cr.)
Prerequisite(s): Permission of instructor

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

Psychology Courses

PSY 101 **Introduction to Psychology** (3 Cr.)
Prerequisite(s): None

This course introduces major topics in psychology, specifically as they relate to cognition and learning. These topics include perception, cognition, personality and social psychology, and biological aspects of behavior. Students are also introduced to human information processing, memory, problem solving, attention, perception, and imagery. Other topics covered may include mental representation and transformation, language processing, and concept formation.

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.

PSY 250 **Psychology of Myth** (3 Cr.)
Prerequisite(s): PSY 101

This course addresses the meaning of myth from the perspective of Jungian archetypes, archetypal projections as image, the Amplification Method of dream analysis, and Campbell's mythic parallels. Carl Jung and Joseph Campbell had a radical influence on the study of myth, and their influence generated a new understanding of human psychology.

PSY 320 **Psychology of Interactive Drama** (3 Cr.)
Prerequisite(s): PSY 201, ENG 110 or ENG 116

The course explores the rhetorical patterns and psychological characteristics of dramatic architecture. The course illustrates how neural processes structure the cognitive unconscious, how this structure is related to image projection and perception, and how it contributes to the interactive learning process. Exercises are designed to help students understand the psychology related to character design and personality development, archetypes, conflict, plot patterns, back-story, dialogue, exposition, lysis, premise, and the psychological dynamics of human choice

PSY 350 **Psychology of The Media** (3 Cr.)
Prerequisite(s): PSY 201

The course explores the psychology of advertising from its emergence, its relationship to the psychology of propaganda, its influence on political thought during the latter half of the 20th century, and its influence on contextual value formations and cultural reality.

PSY 399 **Special Topics in Psychology** (3 Cr.)
Prerequisite(s): Permission of instructor

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Social Sciences Courses

SOS 115 **Media and Ethics: A Social Science Perspective** (3 Cr.)
Prerequisite(s): None

This course guides students in the ethical assessment of both the processes and outcomes of social decision-making. After an introduction to basic ethical theories, students acquire an understanding of the structure of social institutions and the

process through which one makes social choices. Central to the analysis is a study of ethics as a criterion for assessment of social decision-making with emphasis on the study of particular issues of social choice. The course also provides a theoretical framework within which to spot and analyze ethical issues in the media.

SOS 150 **Society and Technology** (3 Cr.)
Prerequisite(s): None

This course draws on techniques and perspectives from the social sciences, humanities, and cultural studies to explore technology and change in the modern era. In particular, students examine how technology influences and is influenced by values and cultures in America and abroad. The course helps students recognize the range of consequences that technology in general, and information and communication technology (ICT) in particular, have when shaped and used by individuals, organizations, and society. Through readings, discussion, lectures, and written assignments, students become acquainted with current controversies related to the socio-cultural dimensions of technology in the "digital era."

While the course examines the impact of technologies—including video gaming and robotics—on the contemporary world, it also uses an historical approach to address some of the technological innovations that have most affected U.S. society in the past. The course considers how technologies are developed and sustained, and how they interact with and affect our urban culture. Specific themes likely to be addressed include technology's impact on the private and public spheres; the body and the self in cyberspace; and the criteria used to determine a technology's success, failure, and danger.

SOS 180 **Race and Gender in Twenty-First Century America** (3 Cr.)
Prerequisite(s): ENG 110

This course takes a close look at current debates on race, gender, and ethnicity in American society. It begins with an overview of definitions of race, gender, and ethnicity, exploring what they have meant in the past and what they mean now. Then the course examines the intersections between race, gender, and ethnicity, asking the following questions: How do race and ethnicity differ, and how are they related? What difference does race make? How are race and gender related? Where does sexual orientation fit into the discourse on gender, and how does it fit into discussions on race and ethnicity?

Current debates on race, gender, and ethnicity were highlighted by the 2008 election of the first African-American president and the ever-growing prominence of women in the highest levels of American politics. Does this mean that we have entered a post-racial era? Where exactly do we stand on women and gender-related issues? What about the place of GLBT issues in the public domain? This course explores these themes and topics.

SOS 190 **Introduction to Popular Culture** (3 Cr.)
Prerequisite(s): ENG 110 or ENG 116

This course surveys trends in popular culture and the debates about how those trends affect the larger culture in general. The course will focus on a variety of popular media, which can include: music, video games, movies, television, and social networking. Topics for discussion may cover: the process of invention in popular culture; the relationship between popular culture, intelligence and engagement; the nature of celebrity; the function of simulacra; changes in narrative structure; representation of race and gender, and more.

SOS 399 **Special Topics in Social Sciences** (3 Cr.)
Prerequisite(s): Permission of instructor

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

Department of Life Sciences

Biology Courses

BIO 100 **Visual Perception** (3 Cr.)
Prerequisite(s): None

This course explores the nature of human visual perception. Beginning with the physics of light and the anatomy of the human eye, the course examines how human beings process light information and use this data to survive. Additionally, students examine neurophysiology, perceptual psychology, and artistic traditions. The course gives special consideration to the modern technological and professional uses of this knowledge.

BIO 150 **Human Muscular, Skeletal, and Kinetic Anatomy** (3 Cr.)
Prerequisite(s): None

This course explores the skeletal and muscular structures of the human body. Students learn to identify skeletal and muscular forms from both live models and anatomical references. Additionally, students consider terminology, structural arrangement, and kinetic function. The course gives special emphasis to adapting this knowledge to the needs of artists and animators.

BIO 200 **Animal Muscular, Skeletal, and Kinetic Anatomy** (3 Cr.)
Prerequisite(s): BIO 150

This course introduces the major skeletal and muscular structures of animals. Students extrapolate their knowledge of the human form to the structure and form of a variety of animal types, specifically focusing on the impact of locomotion and feeding strategies on form. Additionally, students consider terminology, structural arrangement, and kinetic function. The course also considers standard locomotion cycles and the relationship between humans and various animals. It gives special emphasis to adapting this knowledge to the needs of artists and animators.

BIO 225 **Animal Motion: Sequential Limb Movement** (3 Cr.)
Prerequisite(s): None

This course introduces the major locomotion cycles with the associated skeletal and muscular structures of animals in motion. Students compare the moving bipedal, human-like form to the structure and form of a variety of animal types. Special emphasis is placed on the impact of locomotion on form. Vocabulary, structural arrangement, and kinetic function are all considered. The course also considers standard locomotion cycles of humans and various animals. Special emphasis is given to adapting this knowledge to the needs of artists and animators.

BIO 399 **Special Topics in Biology** (3 Cr.)
Prerequisite(s): Permission of instructor

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

Department of Mathematics

Mathematics Courses

MAT 100 Precalculus with Linear Algebra and Geometry (4 Cr.)
Prerequisite(s): None

This course presents fundamentals of college algebra and trigonometry, with an introduction to concepts in 2D geometry and linear algebra. Topics include: polynomial, rational, trigonometric, exponential and logarithmic functions as well as their inverses; analytic trigonometry, trigonometric identities, the unit circle, and trigonometric functions of a real variable; introduction to linear systems, basics of linear transformations in 2D; vectors, parametric lines, dot product, and projections in 2D.

MAT 105 Introductory Probability and Statistics (3 Cr.)
Prerequisite(s): None

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

MAT 120 Mathematics of Music and Sound I (3 Cr.)
Prerequisite(s): None

This course explores the mathematical foundations of music and sound. Topics include: scale systems, just and tempered intervals, oscillations and trigonometry, sound waves, combinatorics and probability.

MAT 140 Linear Algebra and Geometry (4 Cr.)
Prerequisite(s): None
Credit may be received for either MAT 103 or MAT 140, but not for both.

The two main themes throughout the course are vector geometry and linear transformations. Topics from vector geometry include vector arithmetic, dot product, cross product, and representations of lines and planes in three-space. Linear transformations covered include rotations, reflections, shears and projections. Students study the matrix representations of linear transformations along with their derivations. The curriculum also presents affine geometry and affine transformations along with connections to computer graphics. This course also includes a review of relevant algebra and trigonometry concepts.

MAT 150 Calculus and Analytic Geometry I (4 Cr.)
Prerequisite(s): None

This course introduces the calculus of functions of a single real variable. The main topics include limits, differentiation, and integration. Limits include the graphical and intuitive computation of limits, algebraic properties of limits, and continuity of functions. Differentiation topics include techniques of differentiation, optimization, and applications to graphing. Integration includes Riemann sums, the definite integral, anti-derivatives, and the Fundamental Theorem of Calculus.

MAT 180 Vector Calculus I (4 Cr.)
Prerequisite(s): MAT 140 & Prior calculus experience
Credit may be received for either MAT 150 or MAT 180, but not for both.

This course extends the standard calculus of one-variable functions to multi-variable vector-valued functions. Vector calculus is used in many branches of physics, engineering, and science, with applications that include dynamics, fluid mechanics, electromagnetism, and the study of curves and surfaces. Topics covered include limits, continuity, and differentiability of functions of several variables, partial derivatives, extrema of multi-variable functions, vector fields, gradient, divergence, curl, Laplacian, and applications.

MAT 200 Calculus and Analytic Geometry II (4 Cr.)
Prerequisite(s): MAT 150 or MAT 180

This course builds on the introduction to calculus in MAT 150. Topics in integration include applications of the integral in physics and geometry and techniques of integration. The course also covers sequences and series of real numbers, power series and Taylor series, and calculus of transcendental functions. Further topics may include a basic introduction to concepts in multivariable and vector calculus.

MAT 220 Mathematics of Digital Sound Processing (3 Cr.)
Prerequisite(s): MAT 200

This course explores further topics in the mathematical foundations of music and sound, with emphasis on digital signal processing. Topics include: Digital signals and sampling, spectral analysis and synthesis, discrete fourier transforms, FFT, convolution, filtering, wave equation, Bessel functions, sound synthesis and physical modeling.

MAT 225 Calculus and Analytic Geometry III (3 Cr.)
Prerequisite(s): MAT 200 or MAT 230

This course extends the basic ideas of calculus to the context of functions of several variables and vector-valued functions. Topics include partial derivatives, tangent planes, and Lagrange multipliers. The study of curves in two- and three-space focuses on curvature, torsion, and the TNB-frame. Topics in vector analysis include multiple integrals, vector fields, Green's Theorem, the Divergence Theorem and Stokes' Theorem. Additionally, the course may cover the basics of differential equations.

MAT 230 Vector Calculus II (4 Cr.)
Prerequisite(s): MAT 180
Credit may be received for either MAT 200 or MAT 230 but not for both.

This course is a continuation of MAT 180. Topics covered include differential operators on vector fields, multiple integrals, line integrals, general change of variable formulas, Jacobi matrix,

surface integrals, and various applications. The course also covers the theorems of Green, Gauss, and Stokes.

MAT 250 **Linear Algebra** (3 Cr.)
Prerequisite(s): MAT 200 or MAT 230

This course presents the mathematical foundations of linear algebra, which includes a review of basic matrix algebra and linear systems of equations as well as basics of linear transformations in Euclidean spaces, determinants, and the Gauss-Jordan Algorithm. The more substantial part of the course begins with abstract vector spaces and the study of linear independence and bases. Further topics may include orthogonality, change of basis, general theory of linear transformations, and eigenvalues and eigenvectors. Other topics may include applications to least-squares approximations and Fourier transforms, differential equations, and computer graphics.

MAT 256 **Introduction to Differential Equations** (3 Cr.)
Prerequisite(s): MAT 200 or MAT 230

This course introduces the basic theory and applications of first and second-order linear differential equations. The course emphasizes specific techniques such as the solutions to exact and separable equations, power series solutions, special functions and the Laplace transform. Applications include RLC circuits and elementary dynamical systems, and the physics of the second order harmonic oscillator equation.

MAT 258 **Discrete Mathematics** (3 Cr.)
Prerequisite(s): MAT 200 or MAT 230

This course gives an introduction to several mathematical topics of foundational importance in the mathematical and computer sciences. Typically starting with propositional and first order logic, the course considers applications to methods of mathematical proof and reasoning. Further topics include basic set theory, number theory, enumeration, recurrence relations, mathematical induction, generating functions, and basic probability. Other topics may include graph theory, asymptotic analysis, and finite automata.

MAT 290 **Linear Algebra and Geometry of Curves** (3 Cr.)
Prerequisite(s): MAT 200 or MAT 230
Credit may be received for only one of MAT 290, MAT 250, or MAT 300

This course combines material from MAT 250 and MAT 300 into a single course. Topics from linear algebra include vector spaces, linear transformations, change of basis, function spaces, and piecewise polynomials. Topics from geometry include Bezier curves, splines, interpolation, and constructive curves and surfaces.

MAT 300 **Curves and Surfaces** (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

This course is an introduction to parameterized polynomial curves and surfaces with a view toward applications in computer graphics. It discusses both the algebraic and constructive aspects of these topics. Algebraic aspects include vector

spaces of functions, special polynomial and piecewise polynomial bases, polynomial interpolation, and polar forms. Constructive aspects include the de Casteljau algorithm and the de Boor algorithm. Other topics may include an introduction to parametric surfaces and multivariate splines.

MAT 340 **Probability and Statistics** (3 Cr.)
Prerequisite(s): MAT 200 or MAT 230, & MAT 258

This course is an introduction to basic probability and statistics with an eye toward computer science and artificial intelligence. Basic topics from probability theory include sample spaces, random variables, continuous and discrete probability density functions, mean and variance, expectation, and conditional probability. Basic topics from statistics include binomial, Poisson, chi-square, and normal distributions; confidence intervals; and the Central Limit Theorem. Further topics may include fuzzy sets and fuzzy logic.

MAT 350 **Advanced Curves and Surfaces** (3 Cr.)
Prerequisite(s): MAT 300

This course is a continuation of MAT 300 with topics taken from the theory and applications of curves and surfaces. The course treats some of the material from MAT 300 in more detail, like the mathematical foundations for non-uniform rational B-spline (NURBS) curves and surfaces, knot insertion, and subdivision. Other topics may include basic differential geometry of curves and surfaces, tensor product surfaces, and multivariate splines.

MAT 351 **Quaternions, Interpolation, and Animation** (3 Cr.)
Prerequisite(s): MAT 300

This course gives an introduction to several mathematical topics of foundational importance to abstract algebra, and in particular the algebra of quaternions. Topics covered may include: operations, groups, rings, fields, vector spaces, algebras, complex numbers, quaternions, curves over the quaternionic space, interpolation techniques, splines, octonions, and Clifford algebras.

MAT 352/552 **Wavelets** (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

This course presents the foundations of wavelets as a method of representing and approximating functions. It discusses background material in complex linear algebra and Fourier analysis. Basic material on the discrete and continuous wavelet transforms forms the core subject matter. This includes the Haar transform, and multi-resolution analysis. Other topics may include subdivision curves and surfaces, and B-spline wavelets. Applications to computer graphics may include image editing, compression, surface reconstruction from contours, and fast methods of solving 3D simulation problems

MAT 353 **Differential Geometry** (3 Cr.)
Prerequisite(s): MAT 300

This course presents an introduction to differential geometry, with emphasis on curves and surfaces in three-space. It includes background material on the differentiability of multivariable functions. Topics covered include parameterized curves and

surfaces in three-space and their associated first and second fundamental forms, Gaussian curvature, the Gauss map, and an introduction to the intrinsic geometry of surfaces. Other topics may include an introduction to differentiable manifolds, Riemannian geometry, and the curvature tensor.

MAT 354 Discrete and Computational Geometry (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

Topics covered in this course include convex hulls, triangulations, Art Gallery theorems, Voronoi diagrams, Delaunay graphs, Minkowski sums, path finding, arrangements, duality, and possibly randomized algorithms, time permitting. Throughout the course, students explore various data structures and algorithms. The analysis of these algorithms, focusing specifically on the mathematics that arises in their development and analysis is discussed. Although CS 330 is not a prerequisite, it is recommended.

MAT 355 Graph Theory (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

This course provides an introduction to the basic theorems and algorithms of graph theory. Topics include graph isomorphism, connectedness, Euler tours, Hamiltonian cycles, and matrix representation. Further topics may include spanning trees, coloring algorithms, planarity algorithms, and search algorithms. Applications may include network flows, graphical enumeration, and embedding of graphs in surfaces.

MAT 356 Advanced Differential Equations (3 Cr.)
Prerequisite(s): MAT 250 & MAT 256

This course covers the advanced theory and applications of ordinary differential equations. The first course in differential equations focused on basic prototypes, such as exact and separable equations and the second-degree harmonic oscillator equation. This course builds upon these ideas with a greater degree of generality and theory. Topics include qualitative theory, dynamical systems, calculus of variations, and applications to classical mechanics. Further topics may include chaotic systems and cellular automata. With this overview, students will be prepared to study the specific applications of differential equations to the modeling of problems in physics, engineering, and computer science.

MAT 357 Numerical Analysis (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

This course covers the numerical techniques arising in many areas of computer science and applied mathematics. Such techniques provide essential tools for obtaining approximate solutions to non-linear equations arising from the construction of mathematical models of real-world phenomena. Topics of study include root finding, interpolation, approximation of functions, cubic splines, integration, and differential equations. Further topics may include stability, iterative methods for solving systems of equations, eigenvalue approximation, and the fast Fourier transform.

MAT 359 Computational Algebraic Geometry (3 Cr.)
Prerequisite(s): MAT 300

This course introduces computational algebra as a tool to study the geometry of curves and surfaces in affine and projective space. The central objects of study are affine varieties and polynomial ideals, and the algebra-geometry dictionary captures relations between these two objects. The precise methods of studying polynomial ideals make use of monomial orderings, Grobner bases, and the Buchberger algorithm. Students have opportunities to program parts of these algorithms and to use software packages to illustrate key concepts. Further topics may include resultants, Zariski closure of algebraic sets, intersections of curves and surfaces, and multivariate polynomial splines.

MAT 361 Introduction to Number Theory and Cryptography (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

This course is an introduction to elementary number theory and cryptography. Among the essential tools of number theory that are covered, are divisibility and congruence, Euler's function, Fermat's little theorem, Euler's formula, the Chinese remainder theorem, powers modulo m, kth roots modulo m, primitive roots and indices, and quadratic reciprocity. These tools are then used in cryptography, where the course discusses encryption schemes, the role of prime numbers, security and factorization, the DES algorithm, public key encryption, and various other topics, as time allows.

MAT 362 Fuzzy Sets and Logic (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

This course introduces the basic theory of fuzzy sets and fuzzy logic and explores some of their applications. Topics covered include classical sets and their operations, fuzzy sets and their operations, membership functions, fuzzy relations, fuzzification/defuzzification, classical logic, multi-valued logic, fuzzy logic, fuzzy reasoning, fuzzy arithmetic, classical groups, and fuzz groups. Students will also explore a number of applications, including approximate reasoning, fuzzy control, fuzzy behavior, and interaction in computer games.

MAT 364 Combinatorial Game Theory (3 Cr.)
Prerequisite(s): MAT 258

Combinatorial Game Theory studies finite, two-player games in which there are no ties. Techniques from logic combinatorics and set theory are used to prove various properties of such games. Typical games include Domineering, Hackenbush, and Nim. The analysis of such games can also be used to study other more complex games like Dots and Boxes, and Go. Topics covered in this course include Conway's theory of numbers as games, impartial and partizan games, winning strategies, outcome classes and algebra of games.

MAT 365 Introduction to Topology (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

This course introduces topology and its applications. Topics covered include topological spaces, quotient and product spaces, metric and normed spaces, connectedness, compactness, and separation axioms. Further topics may

include basic algebraic topology, fixed point theorems, theory of knots, and applications to kinematics, game theory, and computer graphics.

MAT 399 **Special Topics in Mathematics** (3 Cr.)
Prerequisite(s): Permission of instructor

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

MAT 450 **Abstract Algebra I** (3 Cr.)
Prerequisite(s): MAT 250 & MAT 258

This course provides an introduction to the foundations of abstract algebra. The fundamental objects of study are groups, rings, and fields. The student builds on previous courses in algebra, particularly linear algebra, with an even greater emphasis here on proofs. The study of groups is an ideal starting point, with few axioms but a rich landscape of examples and theorems, including matrix groups, homomorphism theorems, group actions, symmetry, and quotient groups. This course extends these ideas to the study of rings and fields. Topics in ring theory include polynomial rings and ideals in rings. The course also covers fields, their construction from rings, finite fields, basic theory of equations, and Galois theory.

MAT 460 **Abstract Algebra II** (3 Cr.)
Prerequisite(s): MAT 400

This course builds on the foundations established in MAT 450. It extends the fundamental objects of groups, rings, and fields to include modules over rings and algebras. The course gives the basic ideas of linear algebra a more rigorous treatment and extends scalars to elements in a commutative ring. In this context, students study the general theory of vector spaces and similarity of transformations. The curriculum also discusses non-commutative algebras and rings, emphasizing examples, such as quaternion algebras. Further topics may include non-associative rings and algebras, Galois theory, exact sequences, and homology.

Department of Music

Music Courses

MUS 115 **Fundamentals of Music and Sound Design** (3 Cr.)
Prerequisite(s): None

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

Department of Physics

Physics Courses

PHY 115 Introduction to Applied Math and Physics (3 Cr.)
Prerequisite(s): None

We live in a world governed by physical laws. As a result we have become accustomed to objects' motions being in accordance with these laws. This course examines the basic physics and mathematics governing natural phenomena, such as light, weight, inertia, friction, momentum, and thrust as a practical introduction to applied math and physics. Students explore geometry, trigonometry for cyclical motions, and physical equations of motion for bodies moving under the influence of forces. With these tools, students develop a broader understanding of the impact of mathematics and physics on their daily lives.

PHY 116 Physics of Music and Sound (3 Cr.)
Prerequisite(s): PHY 115

This is an algebra based physics course that builds upon basic mechanics to examine the physics of music and sound, including interactions with human sensation and perception.

PHY 200 Motion Dynamics (3 Cr.)
Concurrent Course(s): MAT 200 or MAT 230

This calculus-based course presents the fundamental principles of mechanics for simulation and engineering majors. Students learn the laws that govern the mechanical world and how to use these laws to form a simulated world. They examine the concepts involved with kinematics, Newtonian dynamics, work and energy, momentum, rotational motion, and statics.

PHY 200L Motion Dynamics Laboratory (1 Cr.)
Concurrent Course(s): PHY 200

This course presents the concepts of PHY 200 in the laboratory. The experiments allow the student to experience the laws of basic physics involving linear motion, force, gravitation, conservation of energy, conservation of momentum, collisions, rotational motion, and springs. Error analysis and data reduction techniques are taught and required in experimental reports.

PHY 250 Waves, Optics, and Aerodynamics (3 Cr.)
Prerequisite(s): PHY 200

This calculus-based course provides a fundamental understanding of fluid dynamics, oscillations and waves, optics, and thermodynamics. By understanding the physical laws governing these phenomena, students are able to implement ray casting and ray tracing algorithms, as well as create realistic flight simulators, lens effects, and many-body simulations.

PHY 250L Waves, Optics, and Thermodynamics Laboratory (1 Cr.)
Concurrent Course(s): PHY 250

This course presents the concepts of PHY 250 in the laboratory. The experiments allow students to experience the physical laws involving oscillations, waves, sound, interference, lift, drag, heat, optics, and entropy. Extended error analysis and statistics are taught and required in experimental reports.

PHY 270 Electricity and Magnetism (3 Cr.)
Prerequisite(s): PHY 200

This calculus-based course studies the basic concepts underlying electrical and magnetic phenomena. It considers the following topics: atoms and free electrons; Coulomb's law; the electric field, Gauss's Law, and potential; capacitance, properties of dielectrics, current, resistance, and EMF; DC circuits and instruments, and Kirchhoff's rules; the magnetic field and magnetic forces on current-carrying conductors; magnetic field of a current; electromagnetic induction and magnetic properties of matter; alternating current; Maxwell's equations; electromagnetic waves; semiconductors and the PN junction; and photoelectric effect.

PHY 270L Electricity and Magnetism Laboratory (1 Cr.)
Concurrent Course(s): PHY 270

This course presents the concepts of PHY 270 in the laboratory. The experiments allow students to experience the physical laws involving electric fields, electric potential, electric current, electric charge, capacitance, current, resistance, inductance, circuits, and magnetism. Error analysis and statistics are taught and required in experimental reports.

PHY 290 Modern Physics (3 Cr.)
Prerequisite(s): MAT 200 or MAT 230, PHY 200, & PHY 250 or PHY 270

The wake of modern physics has given rise to massive technological advancements that have changed our daily lives. This course covers many of the modern issues within the field and emphasizes the problem-solving nature of physics. The course is a calculus based scientific examination of topics from general relativity and quantum mechanics through nuclear physics, high-energy physics, and astrophysics.

PHY 290L Modern Physics Laboratory (1 Cr.)
Concurrent Course(s): PHY 290

This course presents the concepts of PHY 290 in the laboratory. The experiments allow students to experience the discoveries of the last 100 years. The Michelson-Morley interferometer, the photoelectric effect, the electron's charge to mass ratio, the Franck-Hertz experiments, electron diffraction and the thermal band-gap. Error analysis and statistics are taught and required in experimental reports.

PHY 300 **Advanced Mechanics** (3 Cr.)
Prerequisite(s): CS 200, CS 250, MAT 150 or MAT 180, MAT 200 or MAT 230, MAT 250, PHY 200, & PHY 250

This course covers the physics behind more complex mechanical interactions as well as the numerical techniques required to approximate the systems for simulations. A thorough analysis of mechanical systems through energy analysis provides the basis for the understanding of linear and rotational systems. The combination of theoretical physics and numerical methods provide students with the background for simulating physical systems with limited computational power. Topics covered include Lagrangian Dynamics, Hamilton's Equations, dynamics of rigid bodies, motion in non-inertial reference frames, the use of the inertia tensor, collision resolution, and numerical techniques including methods of approximation.

PHY 320 **Acoustics I** (3 Cr.)
Prerequisite(s): PHY 250

This course uses fundamental physics to explore topics related to sound and vibration. The simple harmonic oscillator and the generic wave equation will be used to derive acoustic wave equations in three dimensions. Solutions to the acoustic wave equations will be explored.

PHY 321 **Acoustics II** (3 Cr.)
Prerequisite(s): PHY 320

This course uses the tools of physics to explore sound generation, propagation, and detection. Particular attention is given to methods used by humans in each of these areas.

PHY 399 **Special Topics in Physics** (3 Cr.)
Prerequisite(s): Permission of Instructor

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