

PURDUE

U N I V E R S I T Y



COLLEGE OF TECHNOLOGY

Master of Science in Technology

with a Specialization in

Applied Computer Graphics

GRADUATE STUDENT HANDBOOK

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HOW TO USE THIS HANDBOOK?

The Handbook was developed by the Department of Computer Graphics Technology (CGT) to act as a supplement to the current College of Technology Graduate Handbook. The College handbook can be found online at the College of Technology website

(http://www.tech.purdue.edu/pages/graduate_programs/current_info.html). This document is intended to clarify and emphasize the expectations that the CGT Department has relative to the pursuit of graduate studies. You will find that content in this Handbook is similar to that of the College in most cases. Where there are differences, the Department of Computer Graphics Technology has typically established procedures and rules that fall within, or are more stringent than, those of the College. Especially with regard to credit hours, courses to be taken, and important milestones towards graduation, the policies and procedures in this document varies from that of the College. If you have questions about how to interpret what is in this Handbook, please consult one of the following sources: the College of Technology Graduate Handbook, your major professor, or the CGT Graduate Coordinator.

INTRODUCTION

Graduate study leading to the Master of Science degree with an area of specialization in applied computer graphics is offered through the Department of Computer Graphics Technology and is administered through the Office of the Director of Graduate Study for the College of Technology at Purdue University. This degree program offers thesis or directed project options concentrating on professional development studies in the management, applied research, development, and production of applied computer graphics technology.

A Ph.D. degree program is offered through the College of Technology, which has a more general technological focus. This program option allows opportunities for curriculum development and professional development in educational applications of computer graphics. A separate Handbook provides detailed information for the doctoral program. It can be found at the following web address: http://www.tech.purdue.edu/pages/graduate_programs/phd_index.html.

The mission of the graduate program in Computer Graphics is to prepare graduates for leadership positions in applied computer graphics professions and to advance the knowledge in the application and teaching of computer graphics through applied research, publishing, presentations, and teaching by the faculty and students.

Specific information about graduate study in Applied Computer Graphics Technology may be obtained directly from the Department of Computer Graphics Technology, 401 North Grant Street, Knoy Hall 363, Purdue University, West Lafayette, IN 47907. The telephone number is 1 (765) 494 7505. You may also visit us on the web at <http://www.tech.purdue.edu/cgt/Graduate/index.html/>.

THE APPLIED COMPUTER GRAPHICS SPECIALIZATION

Since the beginning of the information age and the evolution of the computer, computer graphics has emerged and has been recognized by the U.S. government's Directory of Occupational Titles as a professional occupational field. The wide range of applications for computer graphics is creating the need for individuals who are highly skilled in the technology of computer graphics and broadly educated in related interdisciplinary skills, such as instructional design, engineering, graphic design, cognitive psychology, human factors, and management to name a few. The effort to promote intellectual inquiry and to stimulate a recognized body of applied research, graduate study in applied computer graphics in the Department of Computer Graphics Technology at Purdue is designed to focus on four (4) broadly based, but interrelated, branches including spatial cognition, imaging, geometry, and computer graphics technology.

The subject matter of these four interrelated branches comprises an emerging professional field of study called Visual Science. All theses and directed projects in computer graphics technology will relate

specifically to one or more of the recognized branches and areas of study identified above. In addition, for those wanting to specialize in education and training, a fifth option would be applied research related to learning through the School of Education.

ADMISSION PROCESS

The Department of Computer Graphics Technology graduate committee reviews several important criteria in a holistic fashion when evaluating an application for graduate study in the CGT department. This information is followed by the graduate committee member's remarks regarding the applicant's information. The following criteria are considered when reviewing an applicant's request for admission:

GRE Scores: The committee will look at GRE scores in two different ways. Scores at or above the 50th percentile (or at least 400 (verbal) and 600 (quantitative)) will serve as a goal for admission. The Analytical score on the GRE will be at or above 4.0 for the revised version of the GRE or at or above the 50th percentile for the older version.

Statement of Purpose: This document should also include the applicant's professional goals and objectives as they relate to computer graphics. It should not appear that an applicant wants to simply take content similar to the CGT undergraduate curriculum and receive graduate credit for such work.

Previous GPA: There is no minimum GPA required for admission outside those set by Purdue University and the College of Technology, which is 3.0. The CGT graduate committee uses a GPA of 3.2 as a goal for admission. A lower GPA will not disqualify a candidate but will lead to a more in-depth examination of the applicant in regards to the other admissions materials.

Letters of Recommendation: Letters of recommendation should come from at least three (3) people that can attest to the applicant's professional abilities, goals, and background as it relates to computer graphics. These letters should also outline the applicant's professional maturity and academic ability. For applicants that have been in the workforce for several years, positive letters of recommendation attesting to the candidate's knowledge gained while on the job are helpful.

Professional Experience: Consideration will be given to any internships, co-ops, or professional work experience and its relationship to the applicant's undergraduate degree program and the candidate's Statement of Purpose for admission to graduate school. Experience addressing any potential deficiencies in their academic background will be noted.

Nature of Academic Coursework: Consideration will be given to the applicant's academic major and its inherent rigor. An applicant's profile should contain examples of proficiency within the CGT department's areas of core competency: creativity, technology, visualization, and communication. The CGT Graduate Committee may use this record as a guide for determining any potential conditions for admission related to coursework.

Graduate Core Competencies: The applicant should appear to possess the ability to become proficient within the CGT department's graduate core competencies during their course of study:

- Research (investigate / explore / qualitative v. quantitative)
- Methodology (procedures / logic / structure)
- Application (of knowledge, skills)
- Demonstration of Leadership Potential

Portfolio Samples: Does the work reflect the applicant's true ability? The applicant should provide at least four (4) examples of their CG work, and the work should be presented in a professional manner and of the highest quality. The samples presented should emphasize the applicant's area(s) of interest.

Writing Sample: The writing sample should exhibit the applicant's ability to develop a coherent and concise thought process, and it should clearly emphasize the applicant's area(s) of interest. The writing

sample should be written at a level beyond the Statement of Purpose, such as a term paper or a journal article.

Occasionally, a student who does not meet the standard for unconditional admission may be recommended for conditional admission, provided evidence is presented (for example, a high performance on the Graduate Record Examination or a strong professional portfolio) which indicates that the student's potential for success is not adequately reflected in their academic record.

An applicant having interest in the computer graphics discipline may not have the technical, artistic, or mathematical foundations necessary to go directly into the graduate program. A prospective applicant for study in applied computer graphics that does not have formal education, training, or relevant experience in computer graphics may be required to complete prescribed **undergraduate** courses in computer graphics as part of his or her graduate study requirements as directed by the CGT Graduate Review Committee. Such courses **will not** be available for use on the master's degree plan of study and must be taken before enrolling in graduate-level computer graphics courses.

Conditional admission requires that certain minimum performance standards be established, such as "must achieve at least a 3.00/4.00 graduate index at the completion of the first twelve (12) credits following admission to the master's degree program."

The Graduate School will monitor academic conditions of admission for all conditionally admitted students. Each semester the Graduate School will remove the eligibility to register for future sessions for all students who failed to satisfy their conditions of admission in the previous session. (Thus, there is a grace period of one semester.)

Departments are requested to justify and indicate any conditions under which a student should have his or her eligibility to register restored allowing continuation of degree study. The justification is requested by a memo from the Department Head (or Departmental Graduate Coordinator) and routed through the Director of Graduate Study for the College of Technology, detailing reasons why the student should be permitted to continue. Upon Graduate School approval, the eligibility to register will be restored.

The deadlines for completed applications are as follows:

Domestic Applicants	International (outside the U.S.)	International (within the U.S.)
Fall April 1	Fall April 1	Fall April 1
Spring October 1	Spring September 15	Spring October 1
Summer April 1	Summer February 15	Summer April 1

CREDIT HOUR REQUIREMENTS

The master's degree programs for all departments within the College are administered through the Office of the Director of Graduate Studies for the College of Technology. The College of Technology has two (2) general degree options that students may choose which do not require the designation of a specific Area of Specialization. They are as follows:

- **The Thesis Option** requires a minimum of 27 credit hours of course work and six (6) hours of thesis research (CGT 698). The thesis must be defended through a public oral defense and examination meeting with your faculty advisory committee and any other interested parties. More detail into the directed project option can be found in the College of Technology Graduate Handbook found on the web site: http://www.tech.purdue.edu/pages/graduate_programs/current_info.html
- **The Directed Project Option** requires a plan of study with a minimum of 30 credit hours of course work and three (3) credit hours of directed project (CGT 598) credit. It must be defended through a

public oral defense and examination meeting with your faculty advisory committee. More detail into the directed project option can be found in the College of Technology Graduate Handbook found on the web site: http://www.tech.purdue.edu/pages/graduate_programs/current_info.html

Regardless of the MS degree option chosen, students **are also expected to submit their work (or a portion of it) for publication by a refereed journal or accepted in a refereed conference proceeding for a national or international professional organization related to your area of study**, as approved by the chair of your committee. Although time limitations may prevent the actual printed article or the presentation from being completed or executed prior to the oral examination, students should provide documentation at the oral examination stating that the article has been accepted for publication in the journal or accepted for a conference presentation and when the journal will be released or when the conference presentation will commence.

TIME LIMITATION

A candidate for the master's degree is expected to complete all requirements for the degree within five (5) years from the completion of the oldest course on the plan of study. However, many students typically finish their degree program in less time.

FINANCIAL ASSISTANCE

Availability

A limited number of graduate teaching and research assistantships are available through the Department of Computer Graphics Technology. Additional appointments are available from other elements of the University, such as the library system and student housing. Details on assistantships are available upon request from the Director of Graduate Study for the College of Technology or on the College of Technology web site (http://www.tech.purdue.edu/pages/graduate_programs/assistantships.html).

Appointments

In order to provide an opportunity for the recipient to progress satisfactorily toward the degree objective, graduate appointments will ordinarily be for no more than one-half time for a maximum of one academic year, and will be reviewed at the end of each academic semester. Renewal of graduate appointments for an additional academic year will be based on satisfactory performance in the position and academic performance toward plan of study requirements. Graduate teaching assistantships are generally granted for no more than four (4) semesters for the MS program, although further funding can be awarded based on departmental needs and prior performance of the graduate students. Assistantships and other forms of financial support are always awarded at the discretion of the CGT Department Head.

ENGLISH REQUIREMENT

The Graduate School of Purdue University requires that all students demonstrate proficiency in the English language before a graduate plan of study may be filed. There are three ways to meet this requirement.

1. Earn no grade lower than "B" in all undergraduate English composition courses; or
2. Obtain a score of 500 or higher on the Verbal Aptitude Section of the Graduate Record Examination (GRE); or
3. Satisfactory performance in ENGL 059 (ENGL 009 for international students), an essay test administered by the Office of Writing Review.

Non-native English speaking applicants must take the Purdue TOFEL exam before applying. If a student is admitted with the condition that the English proficiency requirement must be satisfied, work must begin

during the first semester of enrollment with registration in ENGL 050 (ENGL 009 for international students). If the requirement is not met during the first semester, the student will be registered in ENGL 050 or ENGL 009 for the second semester. The English proficiency requirement must be satisfied by the end of the second enrollment period, or eligibility to register for additional course work will be withdrawn.

APPOINTMENT OF A MAJOR PROFESSOR

Each graduate degree plan of study is unique to the individual student's background, experience, and degree objectives. To assist in the development of a graduate degree plan, a graduate faculty member from within the student's area of specialization will be assigned to give advice to an entering graduate student in establishing a preliminary plan of study and graduate committee. Initial graduate faculty advisors are assigned based on a review of transcripts, statements of purpose, letters of recommendation, and other application materials. Typically the student's initial advisor will also become the major professor and the chair of the graduate advisory committee for the student. A student should request a major professor during the application process, but this request may not always be possible based on advisement load, research commitments, and other factors inherent to the faculty member's schedule. Once established, the major professor will become the most important contact person for the student. Therefore, the major professor and student relationship must be a mutually acceptable one.

ADVISORY COMMITTEE

Each student, with assistance and approval from the major professor, is responsible for establishing an advisory committee for his or her program. The duties of that committee are to advise the student in the preparation of the plan of study and to offer advice and assistance during the period of graduate work.

The committee consists of the major professor, one other member of the College of Technology graduate faculty (refer to the web site on "*College of Technology Graduate Faculty*"), and an advisor for each related area (who must also be a member of the Purdue University graduate faculty). Members of the committee need not be faculty with whom the student has taken course work. However, in practice this is usually recommended. The request for appointment of the advisory committee is made on the same form, and at the same time, as the request for approval of the student's plan of study (refer to the section on "*Plan of Study Requirements*"). In addition, each graduate student is encouraged to explore other areas outside the College of Technology as it relates to their professional goals and development.

The advisory committee must be selected and established **during the first semester**; the committee will then be in place to help the student develop the plan of study and review and approve the student's directed project or thesis proposal, **which must be approved before actual work on the project or research may begin**. The student should discuss the plan of study with the selected advisory committee members and must get their permission to list them on the plan of study before the plan is submitted to the College of Technology Director of Graduate Studies. Should the need arise, changes in the advisory committee after the plan of study has been submitted will be handled on an individual basis through the Electronic Plan of Study form (EPOS) (refer to the section on "*Plan of Study Requirements*").

COMPARISON OF DIRECTED PROJECTS AND THESES

Directed Project

Total immersion in corporate environment, i.e., business/industry focus

Project Format

- Executive summary
- Project Report Body
 - Statement of the problem
 - Significance of the problem
 - Background
- Relevant history

Master's Thesis

Total immersion in academic environment, i.e., academic/university focus

Thesis Format

- Abstract
- Thesis Body
 - Chapter 1: Statement of the problem
 - Chapter 2: Review of the literature

- Assumptions
- Delimitations
- Definitions
- Literature Review
- Procedures employed
 - Development process, or
 - Data collection
 - Instrumentation
 - Analysis
- Conclusions
- Recommendations
- Financial implications
- References
- Appendices

- Chapter 3: Methodology
- Chapter 4: Data analysis
- Chapter 5: Findings, conclusions, discussion, and recommendations

- Bibliography
- Appendices

Points to consider:

- APA Style Manual
- Oral Defense

Outcomes

- Document Outcomes
 - Published results
 - Create knowledge via scholarship
 - Professional publication
- Career Outcomes
 - Future scholars and researchers
- Add to body of Knowledge
- Language of academia – scholarship

Points to consider:

- Generally a business writing style
- Formal Presentation

Outcomes

- Document Outcomes
 - Project accepted
 - Accepted with modification
 - Rejected
 - Professional publication
- Career Outcomes
- Future Captains of Industry
- Add to the bottom line

The Directed Project - A Definition

The directed project is an applied research project that is more extensive and sophisticated than a graduate-level independent study and less formal than a master’s thesis. The overall objective of the requirement is to engage each graduate student in a study, typically industry or business focused, which is sufficiently involved as to require more than one semester to conceive, conduct, and report. The focus is to be placed on a topic with practical implications rather than original research. In so doing, the project should reflect the mission of the College of Technology by advancing technology through developmental research, innovation, and invention.

Directed Project Characteristics

- Written for industry
- Includes a business presentation
- Results in a tangible product of value to business and industry, or to education for business and industry
- Usually involves a technology problem solving activity
- Is documented to permit replication
- Usually involves some form of business or industrial validation
- Generally requires application of a synthesis of coursework

Purposes of Directed Projects

Successful completion demonstrates:

- Ability to identify a business or industry relevant solution to a technology problem
- An ability to define and/or validate a business or industry relevant problem
- Address a technological problem in a systematic and replicable manner
- Effective use of technical/professional research and/or development procedures
- Identify criteria for success/solution of the problem

- Gather information appropriate to the problem by employing business research procedures (e.g., 70% business/industry sources and 30% academic sources versus the reverse)
- Ability to document the research and development activity in a manner that permits replication and assessment of key decisions and alternatives
- Write effectively in a form customary to business and industry
- Prepare and deliver a presentation in a form customary to business and industry

Effective Directed Project Practices

- Directed projects require students to select and employ an effective research & development procedure(s) to address the problem.
- A directed project generates a new solution, product or procedure. It may involve “proof of concept” and it must be of direct value to business or industry or to the education for business or industry.
- Directed projects should incorporate a strategic financial overview component depicting such characteristics as cost, ROI (Return on Investment), etc.
- A component of the directed project should be an Implementation Plan (i.e., recommendations for deploying the developed solution). This plan should include the suggested near and mid term steps.
- Industry partners are encouraged for validation or other involvement.
- Teams of students working on larger projects are permissible as long as each has a unique and significant contribution and that there is a high degree of independence so that one student’s success is not predicated on another’s.
- Employ relevant business/industry writing style manual.

The Master’s Thesis

A Master’s thesis in Technology is a significant piece of original work, typically involving research, a formal written description of that research, and an oral defense of the research. It should contribute new knowledge to the discipline, but will include an extensive review of what others have contributed to the topic as well. The tone should be scholarly, with a primary audience of other information science researchers. The thesis is more than a term paper but less than a doctoral dissertation. For example, a synthesis and description of others' research and writings alone may be appropriate as a term paper. Such a comprehensive "review of the literature" must be included as a section of the thesis but is not sufficient by itself. A doctoral dissertation might use an experimental or survey methodology involving large numbers of subjects on a national or international level. A master’s thesis may be narrower in scope, being restricted to a local problem (e.g., a survey and analysis of information literacy instruction in East Tennessee) or a smaller number of subjects (e.g., case studies of several information entrepreneurs). A thesis should not just be an expression of your opinions; conclusions and opinions must be based on research results and analysis.

Thesis Characteristics

- A thesis typically addresses a theory or knowledge gap. Often it does so by testing or evaluating or by developing and validating a concept or methodology.
- Theses require documentation of the significance of the problem or gap in knowledge they address, i.e., they make a contribution to the discipline!
- A thesis results in a clearly identifiable new (requires documentation of originality) knowledge of significance.
- Generally, a thesis involves the use of one or more of the accepted research paradigms and established research techniques. IT may be quantitative or qualitative in nature. IT may involve historical or philosophical, scientific or technological perspectives. IT may be experimental, descriptive or developmental in methodology. Other forms/paradigms of research scholarship may also be employed if approved by the committee.
- The thesis format must follow the Purdue Graduate School Thesis Guidelines as supplemented and detailed by the College of Technology Graduate Education Committee and documented in the SOT Graduate Handbook.

- A master's thesis demonstrates a high level of reasoning, effective written communication, and is documented in a form that permits replication.
- College of Technology theses employ the APA style format.
- Theses are necessarily filed in Purdue's library.

CGT AREA OF SPECIALIZATION (AOS)

Areas of Specialization constitute pre-configured paths through the SOT Master of Science degree. Typically they are designed to achieve a recognized and specific set of objectives more focused than the general degree. Such Areas of Specialization may reside with a department or they may cut across several departments either with the SOT or outside. Departments may offer more than one Area of Specialization.

The CGT department has an area of specialization called Applied Computer Graphics. **Each graduate student** admitted to the College of Technology that wishes to study **in the Department of Computer Graphics Technology** is expected to list this AOS on their electronic plan of study. The AOS number for Applied Computer Graphics is **970**.

ELECTRONIC PLAN OF STUDY (EPOS) REQUIREMENTS

The Graduate School of Purdue University believes advanced study should be tailored to the individual student's professional and intellectual objectives. Thus, the plan of study is unique to each student's needs and desires. To facilitate such an individually tailored program, each Masters degree plan of study consists of a primary area and one or more related areas. Both the primary area and the related area(s) are based on the relationship of the course content and not on the departmental course prefix.

The development of the plan of study begins as part of the initial course registration. The major professor will discuss the student's background, interests, and degree objectives as part of the preparation for the first enrollment. Based on this discussion, the major professor will request spaces in the appropriate courses. The major professor will also recommend possible related areas and advisors. **The EPOS must be completed before the beginning of the second semester in which the student is enrolled.**

In addition to course work requirements, each student must complete and successfully defend a research project known as a Directed Project (CGT 598) or Thesis (CGT 698). The plan of study should be developed to support this research requirement (refer to the sections on "The Directed Project" or "Thesis"). The plan of study must list all courses the student will take to meet the degree requirements. These include the names for the primary and related areas of study; the course number, course title, and credits for each course; the date when the course was or will be completed; and the research area. Courses taken while a graduate student at Purdue may be considered for fulfilling plan of study requirements only if the student has received a grade of "C" or better (unless required otherwise) in each course listed on the plan. Each member of the advisory committee and the student signs the plan of study. After review, the Assistant Dean for Graduate Studies signs the plan. The plan is then submitted to the Graduate School for formal approval. It is important that the major professor keep a current copy of the approved plan of study and periodically review progress of its completion with the graduate student. These procedures all occur electronically via the EPOS procedure. Upon approval by the Graduate School, the plan of study becomes a contract among the student, the College of Technology, and the Graduate School. When all requirements of the plan of study are completed satisfactorily, the student is awarded the Master of Science (M.S.) degree.

Primary Area

All plans of study will have a primary area focused in applied computer graphics. The primary area will have an applied research, management, or teaching emphasis. The plans of study require 33 semester hours (exclusive of the three (3) semester hours in the directed project CGT 598, or the six (6) semester hours in the MS research CGT 698), with a minimum of 18 semester hours in courses from departments within the College of Technology. The primary area for the Master of Science with a Specialization in Applied Computer Graphics **must** include the following core courses:

CGT 511	The Development of Graphics in Technology
TECH 507	Measurement and Evaluation in Industry and Technology (or STAT 510, STAT 511, or PSY 600)
TECH 646	Analysis of Research in Industry and Technology

Courses included in the primary area (other than the three required core courses above) should be selected to enhance the career goals of the student. Undergraduate courses **may not** be included in the primary area of the plan of study without special permission from the College of Technology Graduate Education Committee. In addition to these required courses, students in the Applied Computer Graphics area of specialization must include required CGT Primary Area Selectives in their EPOS (*refer to the section Plan of Study Guidelines for CGT Area of Specialization below*).

Courses currently being offered by the faculty in Computer Graphics Technology include:

CGT 512	Human Factors of Computer Interface Design
CGT 513	Interactive Multimedia Development and Research
CGT 514	Product Lifecycle Management
CGT 519P	Pre-Production & Special Effects for Computer Animation
CGT 581P	Production in Animation and Visual Effects
CGT 519A	Post-production in Animation and Visual Effects
CGT 519B	The Business of e-Commerce
CGT 519C	Computer Graphics Programming
CGT 519V	Introduction to Virtual Environments
CGT 519R	Augmented or Mixed Realities
CGT 519D	Product Design Using Virtual Environments
CGT 519E	Collaborative Virtual and Augmented Environments
CGT 581R	Advanced Digital Lighting and Rendering

Related Area of Study

Each plan of study must include a related area of at least six (6) semester hours from an area other than Computer Graphics. In some cases, there may be two related areas, if such a plan will enhance the student's professional goals. Examples of related areas on plans of study include: Management, Instructional Design, Art & Design, Curriculum and Instruction, Landscape Architecture, Civil Engineering, Industrial Engineering, Human Factors, Kinesiology, Theatre, and Perceptual Psychology, or one of the disciplines within the College of Technology (e.g., CIMT, MET, CIT, BCM, etc.). Each related area must have a faculty representative on the student's advisory committee. It is highly recommended that this Related Area be outside the College of Technology.

UNDERGRADUATE CREDIT IN A RELATED AREA

A related area may include undergraduate courses (300 or 400 level) **only when followed by appropriate 500- and 600-level courses**, and is subject to the approval of the student's advisory committee and the Assistant Dean for Graduate Studies. Undergraduate courses listed in the related area must be in excess of the baccalaureate degree requirements. Graduate School policy stipulates that 100- and 200-level courses may not appear on a plan of study nor may more than 6 semester hours of 300- and 400-level courses may be listed on a plan.

SOURCES FOR RELATED AREA COURSE

Courses for the related area may be drawn from other schools and departments throughout Purdue University, or from other departments within the College of Technology.

Credit Limitations

The combination of undergraduate excess credit, transfer credit, post-baccalaureate registrant credit, and independent study credit included in a plan of study **must not exceed 15 credit hours**. These credit categories are defined as follows:

UNDERGRADUATE EXCESS CREDIT

Undergraduate students attending Purdue University who have time available to take courses in excess of their undergraduate degree course requirements may earn a maximum of 9 semester hours of credit in 500- and 600-level courses that were taken and declared as graduate work on Registrar's Form 350 **at the time that grades were filed for that semester**. Undergraduate excess credit will be certified by the Registrar only if the student (1) took the course during the senior year; (2) the student received a grade of at least "B" in the course; (3) the course was designated as a graduate course; and (4) the student's work in the course was performed at the level required for graduate students in the course.

TRANSFER CREDIT

A maximum of 6 semester hours of credit completed at another institution may be included in the plan of study. Graduate School policy states that transfer credit will be allowed **only for courses in which a grade of "B" or better was obtained**. A catalog description of the course and an official transcript showing completion of the course and the grade received must be submitted with the plan or study.

POSTBACCALAUREATE REGISTRANT CREDIT

The Graduate School has created an enrollment category known as "post-baccalaureate registrant" to enable those who have a bachelor's degree to enroll in courses that are considered appropriate to the registrant's personal objectives. Credit earned in this category is available for inclusion on a plan of study at the discretion of the advisory committee, the recommendation of the College of Technology Graduate Education Committee, and the approval of the Graduate School.

A **maximum of 12 credit hours** of graduate credit earned as a post-baccalaureate registrant may be included on a plan of study; no post-baccalaureate course in which a grade of less than "B" was earned will be permitted.

NOTE: The sum of credits earned as undergraduate credit and in post-baccalaureate registrant status that may be used on a plan of study is **limited to 12 credit hours**.

INDEPENDENT STUDY CREDIT

A maximum of six semester hours of independent study credit (e.g., CGT 590, CGT 519, or EDCI 590) may be included in a plan of study. Registration for independent study courses will be permitted only after the plan of study is initiated (refer to the section on "*Registration for an Independent Study Course*" below for procedures for enrolling in CGT 590).

Plan of Study Guidelines for CGT Area of Specialization

CGT Primary Area Core: 9 credit hours*

CGT 511	The Development of Graphics in Technology
TECH 507	Measurement and Evaluation in Industry and Technology
TECH 646	Analysis of Research in Industry and Technology

CGT Primary Area Required Selectives:

<u>3-9 credit hours for Thesis Option; 6-9 for Directed Project Option</u>	
CGT 512	Human Factors of Computer Interface Design

CGT 513	Interactive Multimedia Development and Research
CGT 514	Product Lifecycle Management

CGT Primary Area Content Selectives: 0-9 credit hours

CGT 519P	Pre-Production & Special Effects for Computer Animation
CGT 581P	Production in Animation and Visual Effects
CGT 519A	Post-production in Animation and Visual Effects
CGT 519B	The Business of e-Commerce
CGT 519C	Computer Graphics Programming
CGT 519V	Introduction to Virtual Environments
CGT 519R	Augmented or Mixed Realities
CGT 519D	Product Design Using Virtual Environments
CGT 519E	Collaborative Virtual and Augmented Environments
CGT 581R	Advanced Digital Lighting and Rendering

CGT Related Area Options: 6 credit hours (minimum)

Examples of related areas on plans of study include Management, Instructional Design, Art & Design, Curriculum and Instruction, Landscape Architecture, Civil Engineering, Industrial Engineering, Human Factors, Kinesiology, Theatre, and Perceptual Psychology, or one of the disciplines within the College of Technology (e.g., CIMT, MET, CIT, BCM, etc.). A list of possible courses is contained at the back of this Handbook.

Research Requirement

CGT 698 Thesis Research, 6 credit hours required for Thesis Option

or

CGT 598 Directed M.S. Project Research, 3 credit hours required for Directed Project Option

Students pursuing Thesis Option must complete at least 21 credit hours from the CGT Primary Area course list. Directed Project Option students must complete at least 24 credit hours from the CGT Primary Area course list

** All students pursuing a CGT Area of Specialization must take these courses.*

EXAMINATION REQUIREMENT

Each candidate must pass a final oral examination in order to graduate, regardless of the degree option chosen. Student can expect the examination to include a defense of their thesis or project and the coursework they have taken. The oral examination is taken during the semester in which candidacy is declared and will be conducted by the candidate's examining committee.

Examining Committee

The examining committee will always include the members of the student's advisory committee. The Director of Graduate Study for the College of Technology may appoint additional members. The advisory committee chairperson (the major professor) may recommend additional members for appointment (refer to the section on "*Post-Project Activities*").

DIRECTED PROJECT AND THESIS PROCEDURES

Directed Project CGT 598 Enrollment

Exact enrollment timing can vary, but at least two consecutive enrollments in CGT 598 are required. Typically, **the first enrollment is for 1 semester hour of credit in the next-to-last academic term** (but earlier enrollment is permitted if appropriate). During this academic session, a proposal is developed and approved by the advisory committee. Subsequent registration in CGT 598 is not permitted until the approved and signed proposal has been filed in the Graduate Studies Office. **The second CGT 598**

enrollment is for 2 semester hours of credit, in which the study is conducted, the final report is written, and the study is defended in an oral examination.

Students not completing their project in the two enrollment periods are required to enroll for 1 semester hour of credit each term until the project has been completed. All candidates must be enrolled in CGT 598 for at least 1 semester hour of credit in the academic session in which the degree is awarded.

Thesis CGT 698 Enrollment

Exact enrollment procedures can vary, but at least two consecutive enrollments in CGT 698 are required. Typically, **the first enrollment is for 1-3 semester hours of credit in the next-to-last academic term** (but earlier enrollment is permitted if appropriate). During this academic session, a proposal is developed and approved by the advisory committee. Subsequent registration in CGT 698 is not permitted until the approved and signed proposal has been filed in the Graduate Studies Office. **The second CGT 698 enrollment is for 3-5 semester hours of credit**, in which the study is conducted, the final report written, and the study defended in an oral examination.

Students not completing their project in the two enrollment periods are required to enroll for 1 semester hour of credit each term until the project has been completed. The candidate must be enrolled in CGT 698 for at least 1 semester hour of credit in the academic session in which the degree is awarded.

Grades for CGT 598 Directed Project Research

Performance in any CGT 598 Directed Project course is graded using the following scale:

- Pass – used where the student has met or exceeded requirements
- No Pass – used where the student has not met requirements and has not invested appropriate amounts of effort
- Incomplete – used where the student has invested appropriate amounts of satisfactory effort but the project is not yet finished

Grades for CGT 698 Thesis Research

Performance in any CGT 698 Thesis course is graded using the following scale:

- Satisfactory – used where the student has met or exceeded requirements for satisfactory progress
- Unsatisfactory – used where the student has not met requirements and has not invested appropriate amounts of effort
- Incomplete – used where the student has invested appropriate amounts of satisfactory effort but the project is not yet finished.

GENERAL GUIDELINES FOR COMPLETING THE THESIS OR DIRECTED PROJECT

1. Explore a topic as part of plan of study development.
2. Prepare a brief typewritten preliminary proposal describing the problem, rationale, related literature, and procedures.
3. Discuss the preliminary proposal with the major professor.
4. Expand and refine the proposal, if needed, based on the major professor's suggestions.
5. Circulate the tentative proposal for advisory committee comments and revisions.
6. Secure approval signatures from all members of the advisory committee on the cover page of the final version of the proposal.
7. Distribute a copy of the approved proposal to each advisory committee member and file the original in the College of Technology Graduate Studies Office and the CGT Departmental Office.
8. Carry out the proposed investigation.
9. Prepare an appropriate report including, but not limited to, a description of the problem, rationale, related literature, procedures, results and/or recommendations, and a discussion of the results/recommendations.
10. Confer with all members of the advisory committee to establish a date and time for the final oral examination. Complete the **Form 1** and submit to the Office of Graduate Studies. This

must be done a minimum of three weeks prior to the exam date. A conference room will be arranged and confirmation sent to all committee members.

11. Thesis students must submit a **Request for Examining Committee (GS Form 8) no less than two weeks prior to the exam date.**
12. Meet with the major professor to edit the report into a final draft.
13. Only after receiving permission from your major professor, deliver a copy of the final report to each examining committee member at least two weeks prior to the final oral examination.
14. Defend the investigation to the examining committee and other interested faculty and students during the final oral examination.
15. Correct any identified deficiencies.
16. Secure approval signatures from each member of the examining committee on the completed report.
17. Submit the original signed final project report to the School of Technology Office of Graduate Studies, the CGT Departmental Office, a copy to the major professor, and a copy to each examining committee member requesting a copy.

REGISTRATION FOR AN INDEPENDENT STUDY COURSE (CGT 590)

Regulations and Restrictions in the Use of Independent Study Courses

Independent study courses may be included in a graduate plan of study only when enrollment is scheduled after the plan of study has been approved.

A copy of the final product or a complete report of the study must be submitted to the professor in charge. Failure to do so may result in an incomplete or failing grade. The final project must be independent of other required course studies (previous, existing, or future).

Enrollment Procedures

The student must:

1. Meet with your professor to discuss your proposed study and secure his/her approval for the project you envision.
2. Incorporating your professor's input, prepare a detailed project prospectus (typed or word processed, use APA format, title page), including the following indicated sections.
 - a. Problem: Define the rationale and delimit your problem area (explain your interest in pursuing the project, why this area is of concern to you). How does this project relate to your degree objectives?
 - b. Purpose and Objectives: What do you hope to accomplish? Provide a physical numbered listing of all objectives you expect to accomplish.
 - c. Procedures: Explain the methods you expect to use and any unusual requirements for materials, equipment, or facilities. A graphical time line and two progress reports from the student must be submitted by the student to the professor in charge between weeks three and ten of the semester. Specifically, indicate key deadline dates for each progress report and deliverable. Provide a narrative, flow chart, or outline of step-by-step procedures used to complete this study. If applicable, provide a supply and material cost worksheet.
 - d. Outcomes: What will be the tangible results (deliverables, i.e. software source code, papers, reports, products, or summaries) of your study? Who will receive copies (office, professor, co-working professor, and student)? Will you conduct a formal presentation of your results?
3. Meet with your professor in charge to discuss and refine your project prospectus.
4. Revise the prospectus as necessary. Complete the INDEPENDENT STUDY AUTHORIZATION FORM (http://www.tech.purdue.edu/pages/graduate_programs/forms_documents.html);

- attach it to the front of the prospectus; and secure the signatures of your academic advisor and the professor in charge of the independent study course you will be taking.
5. Submit the signed copy of your request to the Graduate Secretary in the Student Services Office, Room 150 KNOY, for approval. The prospectus must be accompanied by a completed course request (Form 23). A copy of your project -prospectus must be given to the professor in charge. DO NOT submit the Form 23 at the Graduate desk in Student Services prior to securing the department head's approval for the prospectus. Approval criteria include:
 - a. 1) Total numbers of independent study courses on Plan of Study; and
 - b. 2) Focus on a College of Technology discipline.
 6. The Graduate Secretary will make and distribute copies to appropriate persons and file the original in the departmental office. Make sure to keep a copy for yourself.

Regulations and Restrictions in the Use of Independent Study Courses

1. Independent study may be included in a graduate plan of study only when enrollment is scheduled after the plan of study has been approved. Check with your advisor for other restrictions that may apply to you. Typically, such courses cannot be added to your schedule after the third week of classes.
2. You must submit a copy of your final outcomes (using APA format) for the study to the department head for departmental files, and a copy to the professor in charge before the beginning of finals week. Failure to do so can result in an incomplete or a failing grade.
3. All work submitted must be independent of other course work (previous, existing, or future).

CHECKLIST FOR DEGREE COMPLETION

The following checklist will help students map a path through the College of Technology's Master of Science program. Specific and official deadlines are announced each semester, posted in the College's Graduate Display Case in the hall outside of Knoy Room 178, and are also available from the College's Graduate Office.

First Semester

1. If the transcripts submitted with the application for admission were not complete, arrange to have two copies of the final transcript showing receipt of the baccalaureate (bachelor's) degree sent to the Assistant Dean for Graduate Studies, College of Technology, 401 N. Grant St., Purdue University, West Lafayette, IN 47907-2021.
2. Complete English proficiency requirements (if necessary)

With the help of the major professor:

3. Discuss your career and educational objectives and, within the framework of the College of Technology Master's Degree, draft a preliminary plan of study. Review the optional Areas of Specialization as you work.
4. Select a Master's committee consisting of your Major Professor and at least two graduate faculty members. At least two of your committee members must be regular, College of Technology graduate faculty. You may select one or more additional faculty to serve on your Master's Committee and in some cases this is clearly advantageous.
5. Discuss the preliminary plan of study with each of the members of the advisory committee.
6. Using the Electronic Plan of Study (EPOS) system, submit your draft plan of study to your committee members and the College of Technology Graduate Office.
7. Refine the plan of study, if needed, based on the committee's suggestions.
8. Using the Electronic Plan of Study (EPOS) system, submit your final plan of study to your committee members and the College of Technology Graduate Office.
9. Identify a tentative directed project problem area.
10. Register for classes for the next semester following approval of the plan of study.

Succeeding Semesters

1. Register for TECH 646 (**during your second semester**) and begin planning for your directed project or thesis.
2. During your third semester (at the latest), register for 1 semester hour of TECH 598 and begin work on the directed project proposal.
3. After the directed project proposal is approved, begin work on the directed project (2 semester hours of TECH 598, to complete the actual directed project).
4. Register for classes for the next session.

Final Semester

1. Check the "Candidate" space on the **Form 23 Course Request Form** when registering for the semester in which graduation is expected.
2. Register for at least 1 semester hour (or the remaining number of hours to bring your total to a minimum of 3 semester hours) of TECH 598 and complete work on the directed project.
3. Register for any remaining courses on the plan of study.
4. Insure that any changes in your plan of study have been approved using the Change process within the electronic plan of study generator.
5. Using the Request to Schedule Oral Exam Form, **arrange the scheduling of the final oral examination at least three weeks prior to the exam date.**
6. Thesis students must submit a **Request for Examining Committee (GS Form 8) no less than two weeks prior to the exam date.**
7. Satisfy the final oral examination requirement and make any revisions to the thesis or directed project that are required by your committee.
8. Submit a final copy of your thesis or directed project to the College of Technology Graduate Studies Office prior to the deadline established by Purdue's Graduate School.

CGT DEPARTMENTAL EXPECTATIONS FOR GRADUATE STUDENTS

- Attend all meetings scheduled by the chair of their advisory committee.
- If awarded an assistantship, attend **all** scheduled course meetings or research meetings as outlined by the supervising faculty member.
- Submit a Plan of Study **before** their **first** semester is complete.
- Establish an advisory committee **before** the **first** semester is complete.
- Attend an IRB sponsored workshop when appropriate and complete the online training modules.
- Submit to the graduate advisory committee a Directed Project/Thesis Proposal **before** starting on the project **and** at least two weeks before the advisory committee review meeting.
- Directed Project/Thesis Proposal will be completed **no later than the end of the semester prior** to the semester in which the student intends to graduate.
- Submit the Directed Project Report to the advisory committee **at least two weeks** before the scheduled presentation.
- Adhere to the established standards as outlined in the College of Technology's *Graduate Student Handbook* and the CGT Departmental Handbook.
- Acquire professional writing and editing support as necessary during the preparation of the research proposal and/or thesis.
- Prepare a paper for publication in a refereed/trade journal or presentation at a conference in conjunction with the completion of the directed project/thesis.
- Attend another student's defense/oral examination.

GRADUATE FACULTY IN APPLIED COMPUTER GRAPHICS

The offering of graduate courses and the detailed supervision of graduate students is the province of the graduate faculty. Members of the University faculty are not automatically members of the graduate faculty. Authority to teach graduate-level courses and to supervise graduate students is granted by the Dean of the Graduate School upon recommendation by the Director of Graduate Study for the College of Technology. Each faculty member desiring to serve as a graduate faculty member must make formal application to and be certified by the Graduate School of Purdue University. Each faculty member certified by the Graduate School is assigned a maximum level of participation based on academic record and professional experience.

The approved graduate faculty members in Applied Computer Graphics are listed below. A current listing of other College of Technology graduate faculty may be obtained from the office of the Director of Graduate Study for the College of Technology or the College website.

Graduate Faculty Research Interests in Applied Computer Graphics

Adamo-Villani, Nicoletta, M.F.A., Assistant Professor

Prof. Adamo-Villani has more than 10 years of experience in 2D/3D Animation and Web Design. She has produced award-winning graphics and animations (aired on national television) for companies such as Marvel Comics and Genesis Designs, and has received public recognition for the design of several web sites.

Her research interest spans two closely related areas: 3D Animation for (a) Education and (b) Human Computer Communication (HCC). She is currently focusing on the application of 3D Character Animation to teaching communicative gestures, i.e., American Sign Language (ASL), and fine manipulative skills. In addition, she is investing her research effort in the development of new character modeling/animation methods and interfaces for the advancement of Human-Computer Communication. She is also interested in the application of 3D Animation to scientific visualization.

Research topics include:

1. 3D Modeling
2. 3D Animation
3. HCI
4. Educational Technology
5. Medical Visualization
6. Cognitive Visualization

Arangarasan, Raj, Ph.D., Research Scientist and Courtesy Appointment in CGT

Raj's research interests are to design, develop and use innovative ideas and technologies in Virtual Environments (virtual reality, distributed collaborative design, advanced visualization), Large Scale Displays (Portable VR systems, CAVE, Tiled Display Wall), User Interface (multi-modal multi-sensory interaction, ubiquitous mobile computing), Augmented Reality and Computer Graphics (photorealistic rendering, computer-aided design, geometric modeling).

Research topics include:

1. Virtual Reality / Augmented Reality
2. Advanced Scientific Visualization
3. Large Scale High Resolution Displays
4. High Performance Computing and Visualization
5. Multimodal User Interaction
6. Mobile Computing and Distributed Environments

Arns, Laura L., Ph.D., Research Scientist and Courtesy Appointment in CGT

Laura's research interests are in virtual environments, human factors in virtual environments, and applications of virtual reality technology. She is interested in finding new uses for VR technology, and

making it more usable and effective. She is currently teaching a graduate course on virtual environments, an undergraduate course on graphics programming, and an interdisciplinary course with CGT, CS, and the Envision Center, focusing on improving the effectiveness of distance education through the use of increased immersion.

Research topics include:

1. Virtual environments/Virtual reality
2. Human factors/interaction in virtual environments
3. Distributed virtual environments
4. Visualization
5. Real-time graphics
6. Graphics Programming

Bertoline, Gary R., Ph.D., Professor and Director of the Envision Center for Data Perceptualization

Dr. Bertoline's research interests are in applying computer graphics, immersive interactive environments, and virtual reality to visualize, interact, and analyze engineering and scientific data and information. Advances in computing platforms and instrumentation techniques have resulted in an exponential growth of data. Efficient interpretation of this data is fast emerging as a key challenge in science, engineering, and business. The human-computer interface has emerged as a major information bottleneck: computer speeds increase, but human comprehension does not. Novel techniques must therefore be developed to effectively utilize the information capacity available to human comprehension.

Another area of interest is in the Visualization of e-Manufacturing Environments and Product Lifecycle Management (PLM). The PLM Center of Excellence at Purdue University is an interdisciplinary center comprised of applied research laboratories, classroom facilities, e-business systems, and technical infrastructure needed to support research-based learning, simulation, and education using digital enterprise technology. A core focus is to develop e-business solutions for the manufacturing industry using emerging technologies that enable global e-manufacturing Product Lifecycle Management (PLM).

Keywords: Computer graphics, simulation, animation, virtual reality, information visualization, immersive environments, product lifecycle management, CAD

Research topics include:

1. Cognitive visualization
2. Engineering design graphics
3. E-enterprise
4. 3D modeling
5. Data management in design/manufacturing
6. Research methods in applied computer graphics

Birchman, Judith A., Associate Professor

Professor Birchman's research interests primarily focus on multimedia design and development and the issues and media components associated with it. Areas include design and layout, interface design, video effects, raster imaging and interactive design. Her interests also encompass concurrent publishing and repurposing print documents for online distribution.

Research topics include:

1. Multimedia design and production
2. Graphical user interface design
3. Creative use of design elements and raster images
4. Digital compositing and special effects
5. Print and online publishing venues

Benes, Bedrich PhD. Assistant Professor

Dr. Benes currently teaches undergraduate courses in computer animation and a graduate course about virtual reality. Prior to joining Purdue, Bedrich worked as Assistant Professor and has taught courses in the fields of 3D computer graphics and real-time rendering in ITESM CCM in Mexico City and in the CTU Prague in the Czech Republic.

Research topics include:

1. Real-time Computer Graphics
2. Procedural Modeling
3. Global Illumination

Burton, Terry L., Associate Professor

Professor Burton's applied research interest's focus on creating computer-aided communications support systems for the manufacturing and construction industries. As a result of this interest, investigation into existing and emerging pervasive technologies and their potential impact on industry is the primary goal of his endeavors. He is currently working with manufacturing and design/build companies to develop and deliver solutions in project based learning environments enabled by the department's high-end *Computer Graphics Architecture Solutions Lab*.

Research topics include:

1. Cognitive visualization
2. Construction and architectural graphics
3. Digital enterprise
4. 3D modeling
5. Data management in design/manufacturing
6. Research methods and applications in computer graphics

Connolly, Pat E., Associate Professor

Professor Connolly is interested in the application of CAD and CAE in the problem solving process. Creativity development and utilization as it applies to design methodology, problem solving, and concurrent engineering are special focus areas. Other topics of interest include product data management (PDM), visualization, virtual reality, and distance learning.

Research topics include:

1. Solid modeling applications
2. Data management & utilization
3. Visualization skill development
4. Learning/teaching styles
5. Computer-based instruction

Cory, Clark A., Associate Professor

Clark's research interests focus on the impact of new and emerging technologies along with cognitive visualization in Architectural, Engineering and Construction (AEC) industry. As a result of his interests, he is currently working with design/build construction and automated manufacturing companies to enhance the construction and manufacturing communication links between management, laborers, and clients. Clark is also actively pursuing the integration of new technologies into the classroom and industrial training settings.

Research topics include:

1. The impact of new technology on the jobsite of construction
2. Lighting Visualization- Architectural and Construction
3. Smart house technology
4. Simulations for design and production processes in construction
5. Improvement of cognitive visualization in construction.
6. The utilization of Models for improved communication during the construction process for English Speaking and Non-English speaking construction workers

Finnegan, John C., Associate Professor (New Albany)

Professor Finnegan's areas of interest are diverse, from the history of CG through traditional technical illustration and design rendering to human-computer interface design. Of particular interest is the use of CG in the area of lighting visualization for the live entertainment industry. Professor Finnegan continues as a practicing Lighting Designer and is always exploring new and emerging technologies in this field. Other areas of interest include the creation of interactive and hypermedia communication tools, explorations in human-computer interface design, usability testing and directing large-scale multimedia events.

Research topics include:

1. Digital and real world lighting visualization for architectural and theatrical subjects
2. Technical illustration and the combination of traditional technical illustration techniques and CG to achieve the best visual communication
3. Curriculum creation for CIT/CS/MIS in the areas of communication visualization, visual design fundamentals and the creation of interactive multimedia, web and HCI design
4. Distance education content and delivery systems

Gabel, Michael G., Associate Professor

Professor Gabel is a Certified Manufacturing Engineer, specializing in computer-aided design, with twenty-seven years of consulting experience for local, state, and national corporations. Professor Gabel has thirty years of University teaching experience and his current interests are directed toward solid modeling and how these models support the design-thru-manufacturing cycle. He was awarded the Hertz Foundation Excellence in Teaching Award in 1982.

Research topics include:

1. Parametric solid modeling applications
2. Development and Implementation of CAD training materials
3. Rapid Prototyping technologies

Glotzbach, Ronald J., Assistant Professor

Professor Glotzbach's research interests include leading-edge technologies that expand the boundaries of dynamic and interactive content delivered and collaborated on via the graphical communication tool that is the web. Related interests include web-enabling software, dynamic content delivery methods, programming graphics, and integration of varying media into highly technological solutions.

Research topics include:

1. Database design, theory, and application for use with dynamic content development and deployment
2. Automation of processes and tasks via the Web
3. Graphics applications in E-Commerce and E-Business
4. Dynamic content deployment to mobile devices

Hartman, Nathan W., Ed.D., Assistant Professor

Dr. Hartman currently teaches undergraduate courses in engineering graphics, 3D solid and surface modeling, and graphics standards and documentation. He also teaches graduate course covering the foundational elements of computer graphics and measurement and evaluation. Dr. Hartman has worked for a variety of companies in using and integrating computer-aided design (CAD) tools into the engineering design process through the development of custom training applications and materials.

Research topics include:

1. Examining the use of constraint-based CAD tools in the design process
2. Development of expertise and knowledge in the use of computer graphics tools
3. Spatial visualization ability
4. Development of graphic science as a discipline and the visual learning model

Miller, Craig L., Ph.D., Professor

Dr. Miller's research interests are in cognitive spatial abilities and they relate to determining how humans visualize spatial information and the development of applied techniques that can be used improve performance in educational and workplace settings. In addition his applied research interests are in the development and advancement of the product lifecycle management concept through curriculum innovations and partnerships with industry.

Research topics include:

1. Product Lifecycle Management (PLM)
2. Computer-aided Design (CAD)
3. Spatial abilities
4. University/industrial partnerships
5. Training and curriculum development

Miller, Susan G., Associate Professor

Professor Miller's research interests are in the development and advancement of visual communication design skills for use in print, multimedia, and hypermedia tools for communication. In addition, her interests also encompass web usability and interface design.

Research topics include:

1. Development of visual communication design skills as it relates to the elements and principles of design in the areas of typography and interface design
2. Print design as it relates to corporate branding and identity
3. Creative problem solving as it relates to visual communication design
4. Web usability and interface design

Mohler, James L., Associate Professor

Professor Mohler's research interests focus on the design, creation and use of multimedia and hypermedia tools for communication. Issues such as human-computer interface design, delivery of non-transient information via CD-ROM and DVD, e-commerce and e-business are the primary foci of his work. Current endeavors are geared toward the application of XML, XSL, databases and scripting to more efficiently and effectively deliver audience-focused content.

Research topics include:

1. CD-ROM and DVD development
2. HCI theory and practice
3. XML, XSL and web scripting
4. Database-driven web development
5. E-commerce and E-business
6. Perception and visualization

Morales, Carlos R., Associate Professor

Professor Morales's research interests include the application of digital video, animation, and interactive technology in the development of visual training solutions. In particular, Carlos is interested in the integration of dynamic web technologies with traditional CD-ROM/DVD technologies.

Research topics include:

1. Distance Learning
2. Integration of CD-ROM and Web Technologies
3. Database driven training solutions
4. E-commerce solutions
5. Streaming video
6. Digital Video Compositing

Ross, William A., Professor

Professor Ross's general research interests include development of applied computer graphics methods for analyzing and enhancing visual and spatial aptitude in communication and learning. Specifically, he is interested in innovative experimentation with 3D computer graphics design and its implications for multi-dimensional human computer interface (HCI) development. Applied research interests include integrating emerging dynamic spatial computer graphic technologies to practical applications in engineering, design, architecture, entertainment, and education.

Research topics include:

1. Animation and time based 3D computer graphics
2. Developmental issues for spatial and 3D human-computer interface design
3. Graphical and non-verbal issues in training and education
4. Graphic technology assessment and evaluation
5. Impact of computer graphic technologies on information convergence and communication
6. Digital enterprise

Sadowski, Mary A., Ph.D., Professor of Computer Graphics and Associate Dean for Undergraduate Programs and Learning

As Associate Dean for Undergraduate Programs and Learning, Dr. Sadowski provides leadership for the School's strategic initiatives in undergraduate education. She serves as coordinator of accrediting activities and initiatives, scholarships, and enrollment management; and provides leadership for activities related to student services and diversity. Dr. Sadowski teaches undergraduate courses in graphic design.

Research topics include:

1. Examining and comparing the learning styles of graphics students and graphics professors
2. Creative thinking and visualization
3. Recruiting and retention of women in Technology
4. Diversity issues in Technology

Sarapin, Marvin, PhD., Professor and Department Head

Dr. Sarapin has over 25 years experience working with undergraduate and graduate students serving as co-chair of doctoral degree committees, chair of Master's degree committees and as a committee member for numerous students. His professional interests include instructional design, development, delivery, and assessment for technical education at all levels of the educational enterprise.

Research topics include:

1. Formative and Summative Evaluation
2. Program Accreditation
3. Outcomes Assessment
4. Non Parametric Statistics
5. Technical Documentation
6. Learning Styles and Cognitive Psychology
7. Technology Transfer
8. Training

Short, Dennis R., Professor

Professor Short's general research interests include an emphasis on the pre and post-production activities involved in CGI and digital cinematography as well as a broad interest in the design, development and production of interactive games. Specifically, he is interested in all aspect of the integration of CGI with live video and film, digital compositing including digital matte painting, visual effects, and the virtual studio or back lot concept. Advanced research interests include synthetic actors and environments as well as the evolution of the production process in a HDTV and digital cinematography environment.

Research topics include:

1. Animation and time based 3D computer graphics
2. Pre and post-production issues in CGI and cinematography
3. Development of synthetic actors and environments
4. Graphic technology assessment for cinematography
5. Interactive game design and development
6. Digital compositing and special effects

POTENTIAL COURSES FOR CGT RELATED AREAS OUTSIDE THE COLLEGE OF TECHNOLOGY

Aeronautics and Astronautics

507 Principles in Dynamics

567 Introduction to Applied Stochastic Processes

Audiology and Speech Sciences

AUS 501 Neural Bases of Speech and Hearing – Sem. 1. Class 3, cr. 3. Prerequisite: AUS 304 or consent of instructor.

AUS 502 Fundamentals of Speech Production and Perception – Sem. 1. Class 2, lab 2, cr. 3

AUS 503 Fundamentals of Hearing – Sem. 1. Class 2, lab 2, cr. 3.

AUS 505 Computer Methods for Studying Speech and Hearing Processes

AUS 507 (BIOL 562, PSY 512) Neural Systems

AUS 540 (EDPS 562) Augmentative and Alternative Communication

AUS 567 Advanced Study of Evoked Responses

AUS 612 Psychoacoustics

Linguistics

AUSL 589 (ANTH 519, COM 507, ENGL 570, FLL 570) Introduction to Semiotics

General Biology

504 (BMS 533) Human Neuroscience

511 Introduction to X-ray Crystallography (GEOS 511) – Sem. 1, Class 3, cr. 3. Prerequisite: CHM 115 and MA 162, or consent of instructor

512 Electron Microscopy and Image Analysis – Sem. 2. Class 3, cr. 3. Prerequisite: PHYS 220, 221, and BTNY 502A, or consent of instructor.

553 Human Physiology I

562 Neural Systems (AUS 507, PSY 512)

Chemical Engineering

684 Advances in Computer Aided Process Design – Sem. 1, Class 3, cr. 3. Prerequisite: CHE 450 or consent of instructor.

Civil Engineering

502 Analytical Methods in Geometrics

503 Photogrammetry I – Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: CE 200 or consent of instructor.

506 Data Adjustment

508 Digital Mapping for Geographic Information Systems – Sem. 2, Class 2, lab 3, cr. 3. Prerequisite: CE 200 and 392, or equivalent, or consent of instructor.

510 Map Projections and Geometric Geodesy – Sem. 1. Class 2, lab 3, cr. 3. Prerequisite: CE 304 or equivalent.

562 Geometric Design of Highways – Sem. 2. Class 2, lab 3, cr. 3. Prerequisite: CE 303 and 463, or equivalent.

563 Airport Design – Sem. 2. Class 3, cr. 3. Prerequisite: CE 361 or 564 or consent of instructor. A field trip is required.

595 Finite Elements in Elasticity – Sem. 1, Class 3, cr. 3. Prerequisite: CE 474 or consent of instructor.

603 Photogrammetry II – Sem. 2. Class 2, lab 3, cr. 3. Prerequisite: CE 503.

675 Finite Element Analysis – Sem 2. Class 3, cr. 3. Prerequisite: CE 577 or 578 or consent of instructor.

Computer Science

510 Software Engineering

CS 530 Introduction to Scientific Visualization – Sem. 1. Class 3, cr. 3. Prerequisite: CS 435 and 481, or equivalent. CS 251 is recommended.

CS535 Interactive Computer Graphics (ME 573) – Sem. 1. Class 3, cr. 3. Prerequisite: knowledge of programming.

CS 574 Advanced Computer Graphics Applications (ME 574) – Sem. 2, Class 3, cr. 3. Prerequisite: CS 535 (ME 573).

Earth & Atmospheric Sciences

GEOS 518 Aerogeology and Remote Sensing – Class 1, lab 6, cr. 3. Prerequisite: PHYS 251, GEOS 111, CE 567, or consent of instructor.

Electrical & Computer Engineering

522 Problems in the Measurement of Physiological Events

538 Digital Signal Processing I

544 Digital Communications

547 Introduction to Computer Communication Networks

569 Introduction to Robotic Systems

570 Artificial Intelligence

574 Software Engineering Methodology

576 Image Synthesis – Sem. 1, Class 3, cr. 3. (Offered in alternate years). Prerequisite: EE 301 or graduate standing.

585 Real-Time Robot Control Laboratory

600 Random Variables and Signals

624 Multimedia Systems – Sem. 1, Class 3, cr. 3. Prerequisite: EE 547 and 562 or equivalent, or consent of instructor.

628 Computer Graphic Simulation & Visualization – Class 3, cr. 3. (offered every 3rd semester). Prerequisite: EE 569 or ME 573 or knowledge of homogeneous transformations.

637 Digital Image Processing I – Class 3, cr. 3. (offered every 3rd semester). Prerequisite: EE 302, and 638, or equivalent.

641 Digital Image Processing II – Class 3, cr. 3. (Offered every 3rd semester). Prerequisite: EE 660 and 637.

661 Computer Vision – Sem. 2, Class 3, cr. 3. Prerequisite: EE 570 or consent of instructor (C, I).

Food Science

520 Image Recovery – Sem 1, Class 3, cr. 3. (offered in alternate years). Prerequisite: MA 261 and CS 156 or equivalent, and consent of instructor.

551 Magnetic Resonance for Food and Agriculture – Sem. 1, Class 3, cr. 3. (offered in alternate years). Prerequisite: CHM 224 and 372, or consent of instructor.

Foods and Nutrition

534 Human Sensory Systems and Food Evaluation

Forestry & Natural Resources

558 Digital Remote Sensing and GIS – Sem 1, Class 2, lab 3, cre 3. Prerequisite: FNR 357 or consent of instructor.

579 Remote Sensing Seminar – Sem 2. Class 1, cr. 1. (Offered in alternate years). Prerequisite: FNR 558 or AGRY 545 or EE 577 or consent of instructor.

658 Advanced Geographic Information Systems (GIS) Concepts – Sem 1. Class 2, cr. 2. Prerequisite: FNR 558 or consent of instructor.

Health, Kinesiology, and Leisure Studies

PE 558 Principles of Perceptual Motor Learning – Sem 1. Class 3. cr 3.

PE 568 Advanced Exercise Physiology – Sem 1. Class 3. cr. 3. Prerequisite: PE 268 or equivalent.

Industrial Engineering

559 Cognitive Engineering of Interactive Software

575 Computer Aided Manufacturing I – Sem 1 and 2. Class 3, cr 3. Prerequisite: IE 370 or equivalent.

577 Human Factors In Engineering (PSY 577) – Sem 1 and 2. Class 3, cr. 3.

580 Systems Simulation – Sem 1. Class 3, cr. 3. Prerequisite: IE 336 or equivalent.
581 Simulation Design & Analysis – Sem 2, Class 3, cr. 3. Prerequisite: CS 156, IE 330, and 336
659 Human Aspects in Computing
675 Computer Aided Manufacturing II – Sem 2, Class 3, cr 3. Prerequisite: IE 575

Management

MGMT 560 Manufacturing Planning and Control – Sem 1 or 2. Class 2-3, cr 2-3. Prerequisite: MGMT 660; or MGMT 460 and consent of instructor; or consent of instructor.

Mechanical Engineering

560 Kinematics – Sem 1, Class 3, cr. 3. Prerequisite: ME 352 (C)
562 Advanced Dynamics
573 Interactive Computer Graphics (CS 535). Sem 1, Class 3, cr. 3. Prerequisite: knowledge of programming.
574 Advanced Computer Graphics Applications (CS 574) Sem 2, Class 3, cr 3. Prerequisite: ME 573

Psychological Sciences

627 Advanced Topics in Visual Perception
628 Perceptual Processes – Sem 2, class 3, cr. 3 (I)

Statistics

501 Experimental Statistics I
502 Experimental Statistics II
514 Design of Experiments
598M Statistical Data Mining

Art & Design

A&D 605 Problems in Industrial Design – Class 1, studio 5, cr. 3. (May be repeated for credit).

Theatre

THTR 562 Advanced Light Design – Sem 2, Class 3, lab 1 (with 2 hours experiential), cr 3. Prerequisite: THTR 362 or consent of instructor (FW).

POTENTIAL COURSES FOR CGT RELATED AREAS WITHIN THE COLLEGE OF TECHNOLOGY

AT 572 Human Error Class 3, cr. 3.

Prerequisites: AT 454 and consent of instructor.

AT 573 Managing the Risk of Organizational Accidents Class 3, cr. 3.

Prerequisites: AT 454 and consent of instructor.

CIT 550 Organizational Impact of Information Technology Class 3, cr. 3.

Prerequisite: Graduate status or consent of Instructor.

CIT 551 Information Technology Economics Class 3, cr. 3.

Prerequisite: Consent of instructor.

CIT 552 Information Technology Project Management Class 3, cr. 3.

Prerequisite: Consent of instructor.

CIT 554 Management of Information Technology Resources Class 3, cr. 3.

Prerequisite: Instructor approval required for enrollment.

CIT 555 Advanced Network Security Class 3 credit 3

ECET 525 Applications in Forensic Engineering Technology Class 3, cr. 3.

IT 507 Measurement and Evaluation in Industry and Technology Class 3, cr. 3.

Prerequisite: Graduate standing or consent of Instructor.

IT 510 Developing Courses for Industry and Technology Class 3, cr. 3.

IT 560 Microcomputer Applications in Industry and Technology Class 3, cr. 3.

Prerequisite: Consent of Instructor.

IT 566 Developing Instructional Programs for Industry and Technology Class 3, cr. 3.

Prerequisite: TECH 510 or consent of instructor.

IT 568 Developing Instructional Materials for Industry and Technology Class 2-3, cr. 3.

Prerequisite: TECH 510 or consent of instructor.

IT 570 Function and Structure of Industry and Distribution Class 3, cr. 3.

Prerequisite: Consent of Instructor.

IT 571 Project Management in Industry and Technology Class 3, cr. 3.

Corequisite: TECH 507.

IT 668 Administering Technical Programs Class 3, cr. 3.

Admission by consent of instructor.

MET 530 Facilities Engineering Technology Class 2, lab. 2, cr. 3.

Prerequisite: undergraduate physics and calculus and senior standing or BS degree in engineering technology or engineering, or equivalent industrial experience.

MET 535 Optimization of Metalcasting Design Class 2, lab. 2, cr. 3 or arranged hours, cr. 3.

Prerequisite: senior standing or BS degree in engineering technology, engineering, or consent of instructor.

MET 546 Industrial Applications of Computer Integrated Manufacturing Class 3, cr. 3.

Prerequisite: CIMT 446 or consent of instructor.

OLS 567 Supervised Field Practice in Industrial Training Cr. 3.

OLS 574 Managerial Training and Development Class 3, cr. 3.

Prerequisite: OLS 374 and 375. Open to seniors and graduate students only.

OLS 576 Advanced Topics in Human Resource Management Class 3, cr. 3.

Prerequisite: graduate student status and OLS 376, or consent of instructor.

OLS 577 Organization and Administration of Training and Development Class 3, cr. 3.

Prerequisite: OLS 375; prerequisite or corequisite: OLS 574. Open to seniors and graduate students only.

OLS 578 Leadership in International Human Resources Class 3, cr. 3.

OLS 579 Emerging World-class Leadership Strategies Class 3, cr. 3.

OLS 580 Interpersonal Skills for Leaders Class 3, credit 3

OLS 582 Leadership and Organizational Change Class 3 Cr. 3.

OLS 590 Individual Research Problems in Supervision and Personnel Cr. 1-6.

Admission by consent of department. (May be repeated for credit.)

TECH 508 Quality and Productivity in Industry and Technology Class 3, cr. 3.

TECH 581 Workshop in Technology Cr. 0-8.

(May be repeated for credit.)

TECH 590 Special Problems in Technology Cr. 1-6.

Admission by consent of department. (May be repeated for credit.)

TECH 621 Seminar in Technology Class 1-3, cr. 1-3.

(May be repeated once for credit.)

TECH 623 Contemporary Technology Problems Class 3, cr. 3.

Admission by consent of instructor.

TECH 696 Design of Research in Industry and Technology Class 3, cr. 3.

Prerequisite: TECH 646.