

CIGP

GUIDELINE

**COMPUTATIONAL
INTERDISCIPLINARY
GRADUATE PROGRAMS**

This guidebook is neither a contract nor an offer of a contract. The information it contains was accurate at the time of publication. Fees, deadlines, appointments, academic requirements, courses, degree programs, and other matters described in this guidebook may change without notice.

Nondiscrimination Policy Statement

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Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Purdue's Equal Opportunity, Equal Access and Affirmative Action policy which provides specific contractual rights and remedies. Additionally, the University promotes the full realization of equal employment opportunity for women, minorities, persons with disabilities and veterans through its affirmative action program.

Any question of interpretation regarding this Nondiscrimination Policy Statement shall be referred to the [Vice President for Ethics and Compliance](#) for final determination.

Table of Contents

1. Computational Interdisciplinary Graduate Programs (CIGP)	1
1.1 Overview	1
1.2 Administrative Structure of Computational Interdisciplinary Graduate Program (CIGP).....	1
1.3 Administration Responsibilities	1
1.3.1 Director of Computational Interdisciplinary Graduate Programs.....	2
1.3.2 Representatives of the Graduate Programs	2
1.3.3 Faculty Members in Affiliated Graduate Programs	2
1.3.4 Responsibilities of the CIGP Director	2
1.3.5 Responsibilities of the Representative	3
1.3.6 Responsibilities of the Faculty Member	3
2. Computational Interdisciplinary Graduate Programs (CIGP) Tracks and Curricular Requirements	5
2.1 Computational Science & Engineering (CS&E).....	5
2.1.1 Course Requirements.....	5
2.1.2 Seminar Requirements.....	5
2.1.3 Plan of Study Requirements.....	5
2.1.4 CS&E Courses Summary.....	6
2.2 Computational Life Science (CLS).....	8
2.2.1 Course Requirements.....	8
2.2.2 Seminar Requirements.....	8
2.2.3 Plan of Study Requirements.....	8
2.2.4 CLS Courses Summary	9
2.2.5 Timeline Summary for Computational Interdisciplinary Graduate Programs	10
3. Computational Interdisciplinary Graduate Programs Policy	11
3.1 Admission.....	11
3.2 Courses, Seminars, and Plan of Study.....	11
3.3 Continuing Doctoral Students.....	12
3.4 Distance Learning Students.....	12
3.5 Guidelines for the Faculty	12

1. Computational Interdisciplinary Graduate Programs (CIGP)

1.1 Overview

Computational Interdisciplinary Graduate Programs offers specializations in Computational Science and Engineering (CS&E) and Computational Life Sciences (CLS) for graduate students in participating departments across Colleges of Agriculture, Engineering, Health and Human Sciences, Pharmacy, Science, and Technology. These programs have over 175 students and 150 affiliated faculty from diverse disciplines.

The two current Computational Interdisciplinary Graduate Programs – Computational Science and Engineering and Computational Life Sciences work largely independently of each other. They are directed by different individuals, have non-overlapping curriculum committees, and largely independent sets of requirements (although, they do share some courses). They are also pre-allocated some resources (primarily in the form of fellowships); however, these allocations are done a-priori. The two programs do share administrative support.

Scaling Computational Interdisciplinary programs beyond the current set of two concentrations requires careful thought and planning. In particular, we put forth the following goals for this planning process:

- Develop an administrative structure for various programs, allowing for flexibility both in terms of new programs, as well as within programs.
- Develop policies for proposing new programs, standard set of guidelines, and processes for approval.
- Develop a uniform curricular framework for all Computational Interdisciplinary Programs.
- Allocate adequate resources for all programs in terms of Graduate Fellowships, Seminar Series, and Visitor Programs.
- Provide a single unified administrative support structure that would avoid duplication of services across the programs.

1.2 Administrative Structure of Computational Interdisciplinary Graduate Program (CIGP)

A two-tiered administrative structure is built to maximize the flexibility for individual concentrations, while providing high-level structure and consistency across concentrations. CIGP, Computational Science and Engineering and Computational Life Sciences, are administered by a graduate committee comprised of member departments. We augment these committees with one representative for each department. CIGP Committee is superintended by the Director of the Computational Interdisciplinary Graduate Program, appointed by the Dean of the Graduate School.

1.3 Administration Responsibilities

The CIGP Committee's role is to create an environment that fosters various computational concentrations, provides them needed resources, ensures consistency across programs, and advocates their cause to the graduate program. For Computational Science and Engineering and Computational Life Sciences, the CIGP Graduate Committee is comprised of a chair appointee and representative of each department.

1.3.1 Director of Computational Interdisciplinary Graduate Programs

Responsibilities of the CIGP Chair include:

- Ensuring consistency of curricular requirements.
- Liaison with distance education programs and various departments.
- Organizing various interdisciplinary events (including recruitment, outreach).
- Organizing interdisciplinary educational projects (GAANNs, IGERTS).

1.3.2 Representatives of the Graduate Programs

Representative of each department oversees the responsibilities of:

- Curriculum development, maintenance.
- Administering allocated resources (fellowships, seminars, events, etc.)
- Arbitrating student exceptions, appeals.
- Working with graduate school to enhance student experiences, from application to graduation.

1.3.3 Faculty Members in Affiliated Graduate Programs

Faculty member assists the Representative to reach the success of associated programs. Specifically, responsibilities of these committees include:

- Ensuring timely progress of students towards their concentrations.
- Ensuring that core and elective courses are offered in a timely manner.
- Maintaining an active seminar/ speaker series.
- Recruiting students interested in computational study (department orientation, CIGP fellowships, others).
- Working with representative on curriculum development, maintenance.

All of the committees will work closely to continually monitor programs and work towards the overall success of the Computational Interdisciplinary programs. In the rest of this document, we describe various responsibilities in detail.

1.3.4 Responsibilities of the CIGP Director

Ensuring consistency of curricular requirements: The Chairs of Computational Science & Engineering and Computational Life Sciences will ensure a consistent set of requirements across various concentrations. The current requirements for all programs is (i) two required courses (selected from among a set of bridge courses), (ii) two elective courses (selected from among a set of courses drawn from different departments (with specific criteria for courses that may be used to satisfy requirements), and (iii) a presentation made to the seminar series and attendance in a prescribed minimum number of seminars.

Liaison with distance education programs and various departments: As Purdue increases its commitment to distance education, it is important that various concentrations be suitably marketed to distance students. This involves significant coordination with the departments to ensure that required courses are offered over distance education in a timely manner, seminars are made available over the internet and academic/ administrative support is provided to distance education students.

Organizing various interdisciplinary events: The success of various programs critically depends on student participation and success. To this end, it is important for the programs to reach out to various units on campus, suitably advertise themselves to students, and to organize periodic events at which students showcase their accomplishments. The CIGP Graduate Committee will be responsible for outreach to the University community with the goal of maximizing participation in various concentrations. Furthermore, the CIGP Graduate Committee will also communicate to the Provost the

accomplishments of various programs and their needs to solicit resources as needed in the form of additional fellowships, faculty lines, and other resources.

Organizing interdisciplinary educational projects: Current Computational Interdisciplinary concentrations have been very successful in attracting other funding in the form of GAANN and ITERS grants from external sources. These are important, since they leverage limited internal resources to bring in larger grants, which can be used to recruit and retain good students. The CIGP Graduate Program will coordinate/ assist in putting together such efforts for various concentrations.

1.3.5 Responsibilities of the Representative

The overall responsibility of maintaining a successful specialization rests with the associated Graduate Committees. These committees will be comprised of one representative from each participating department, and will be coordinated by a designated faculty member. Specific responsibilities of individual Representative of the Graduate Committees include:

Curriculum development, maintenance: The representative of the graduate committee will be required to develop its curriculum within the broad framework of the Computational Interdisciplinary Programs. This requires identification of core and elective courses, ensuring that these courses are offered in a timely manner, establish suitable checkpoints for students, and coordinate with various departments. Also, confirm

Administering allocated resources (fellowships, seminars, events, etc.): Each specialization will be allocated a number of fellowships. The goal of these fellowships is to attract top students into the graduate program. It is the responsibility of the various graduate committees to administer these fellowships (selecting students, monitoring their progress, ensuring that home departments fulfill their commitments after the term of the fellowship).

Arbitrating student exceptions, appeals: Representative of the graduate committee arbitrates appeals from students with regards various requirements and exceptions.

Working with graduate school to enhance student experiences, from application to graduation: A large and vibrant program, such as the one proposed, relies on the quality of student experiences and outcomes. To this end, graduate committees of various concentrations must constantly identify potential problems for students from various departments, work with the graduate school and various departments to remedy these problems, and to provide mechanisms by which students can provide feedback.

1.3.6 Responsibilities of the Faculty Member

Ensuring timely progress of students towards their concentrations: The faculty member must ensure that its students are meeting (or exceeding) all of the academic requirements in a timely manner, establish mechanisms through which exceptions can be detected and remedied, and provide adequate mentoring for students.

Maintaining an active seminar/ speaker series: An integral part of graduate research experience is the presence of a vibrant seminar series. To this end, various graduate committees must ensure that there are a specified minimum number of seminars that are available to the graduate students in the specialization. We strongly believe in the interdisciplinary nature of CIGP. To this end, we expect most seminars to be cross-listed across concentrations.

Recruiting students interested in computational study (department orientation, CIGP fellowships, others): The faculty member introduces the opportunity of computational concentrations to master and

doctoral students in the department. We strongly want students to understand the benefits of the program, carefully considering various advantages involved with the program.

Working with representative on curriculum development, maintenance: There are various computational courses offered across the departments. It is important for committee to help the program maintaining the most up-to-date courses including deleting outdated courses and notifying the program about new courses.

2. Computational Interdisciplinary Graduate Programs (CIGP) Tracks and Curricular Requirements

2.1 Computational Science & Engineering (CS&E)

Computational Science and Engineering (CS&E) curriculum has been designed to provide a broad and interdisciplinary program of the study with a maximum possible flexibility. Students may tailor their programs to their individual needs and explore several training areas.

2.1.1 Course Requirements

There are two required focus areas: Core and Relevant Courses. Core courses are designed to provide a primary focus on various levels of computing, computer programming, algorithms, and parallel computing. Core courses must be selected from a different Core group. When two Core courses are taken from the same group, only one of them is counted toward the Core course, and the other course will be counted toward the Relevant Courses. Relevant courses are selected by the CS&E and CLS faculty members to enhance the experiences of CS&E in specific areas.

Master students must complete total three CS&E courses with a grade of B or higher: two Core Courses (divided into six groups of Introduction to CS, Computational Mathematics, High Performance Computing, Intelligent Computing, Scientific Visualization, and Computational Optimization) and one Relevant Courses.

For doctoral students, one additional Relevant Courses is required – two Core Courses and two Relevant Courses. Courses can be self-selected based on students' research interest consulted with student's major professor. One of the completed courses must be taken from outside student's home department.

2.1.2 Seminar Requirements

CIGP Seminar is a zero credit seminar course (GRAD 68900), offered in fall and spring semesters. Various talks are scheduled with the faculty and doctoral candidate speakers from a diverse computational background.

Master students must register a CIGP seminar course for two semesters and attend at least five seminars per semester and attend the CIGP symposium for the grade of S, Satisfactory. Doctoral students need two additional semesters of CIGP seminar course – total four semesters. During the final graduation year, doctoral students are also required to deliver at least one seminar talk at the CIGP symposium..

2.1.3 Plan of Study Requirements

Plan of study (POS) is filed with the home department for the student's pursuing degree. To fulfill 'Concentration' field on POS, all successfully completed CS&E Courses must be listed on the Plan of Study for auditing purposes. If a master's course is used toward the doctoral degree, it cannot listed on POS and cannot count towards fulfilling CS&E curricular requirements.

A CS&E concentration code, CMEN, is approved when all the CS&E requirements are successfully completed: 'CMEN' for engineering and 'CMSI' for science and other degrees.

2.1.4 CS&E Courses Summary

Computational Science & Engineering (CS&E) Course Summary	
<p>✓ <i>Two Core Courses must be selected from a different Core group and one of the CS&E courses should be taken outside the home department.</i></p>	
Master (total 3 courses)	Doctoral (total 4 courses)
<p><u>Core Courses</u> (select two)</p> <p>Introduction to CS</p> <ul style="list-style-type: none"> • CS 50100 <p>Computational Mathematics</p> <ul style="list-style-type: none"> • CS 51400 • CS 51500 • ME 58100 • ME 68100 <p>High Performance Computing</p> <ul style="list-style-type: none"> • CS 51500 • CS 52500 • ECE 56300 <p>Intelligent Computing</p> <ul style="list-style-type: none"> • ECE 57000 <p>Scientific Visualization</p> <ul style="list-style-type: none"> • CS 53000 <p>Computing Optimization</p> <ul style="list-style-type: none"> • AAE 55000 • CS 52000 • ECE 58000 • IE 53500 • MA 52100 	<p><u>Core Courses</u> (select two)</p> <p>Introduction to CS</p> <ul style="list-style-type: none"> • CS 50100 <p>Computational Mathematics</p> <ul style="list-style-type: none"> • CS 51400 • CS 51500 • ME 58100 • ME 68100 <p>High Performance Computing</p> <ul style="list-style-type: none"> • CS 51500 • CS 52500 • ECE 56300 <p>Intelligent Computing</p> <ul style="list-style-type: none"> • ECE 57000 <p>Scientific Visualization</p> <ul style="list-style-type: none"> • CS 53000 <p>Computing Optimization</p> <ul style="list-style-type: none"> • AAE 55000 • CS 52000 • ECE 58000 • IE 53500 • MA 52100
<p><u>Relevant Courses</u> (select one)</p> <ul style="list-style-type: none"> • Aero. & Astro. Engineering • Agriculture Economics • Biology • Chemistry • Chemical Engineering • Civil Engineering • Computer Sciences • Earth and Atmospheric Sciences • Electrical and Computer Engineering • ECE Courses in Computer Engineering • Food Science • Industrial Engineering • Industrial & Physical Pharmacy • Materials Engineering • Mathematics • Mechanical Engineering 	<p><u>Relevant Courses</u> (select two)</p> <ul style="list-style-type: none"> • Aero. & Astro. Engineering • Agriculture Economics • Biology • Chemistry • Chemical Engineering • Civil Engineering • Computer Sciences • Earth and Atmospheric Sciences • Electrical and Computer Engineering • ECE Courses in Computer Engineering • Food Science • Industrial Engineering • Industrial & Physical Pharmacy • Materials Engineering • Mathematics • Mechanical Engineering

- Medicinal Chemistry & Molecular Pharmacology
- Nuclear Engineering
- Physics
- Psychological Sciences
- Statistics
- Technology

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To view the list of Core and Relevant Courses, click the links below:

<https://www.purdue.edu/gradschool/cigp/academics/courses/cse-core.html>

<https://www.purdue.edu/gradschool/cigp/academics/courses/cse-relevant.html>

2.2 Computational Life Science (CLS)

Computational Life Sciences (CLS) curriculum has been designed to provide a broad and interdisciplinary program of the study with a maximum possible flexibility. CLS students may tailor their programs to individual needs and explore several training areas.

2.2.1 Course Requirements

Computational Life Sciences focuses on three areas: Proficiency Biology, Proficiency Computing, and Foundation Courses. Proficiency courses are designed to provide primary focus on various levels of quantitative modeling, algorithms and software, analysis and data acquisition. Foundation Courses are selected with the faculty in affiliated graduate programs, allowing students to experience computational courses relevant to their research.

To fulfill CLS course requirements, master's student must complete three CLS courses with a grade of B or higher: one Proficiency Computing, one Proficiency Biology, and one Foundation Courses. For doctoral students, one additional Foundation Courses is required -- one Proficiency Biology, one Proficiency Computing, and two Foundation Courses. Courses can be self-selected based on students' research interest consulted with student's major professor.

2.2.2 Seminar Requirements

CIGP Seminar is a zero credit seminar course (GRAD 68900), offered in fall and spring semesters. Various talks are scheduled with the faculty and doctoral candidate speakers from a diverse computational background.

Master students must register a CLS seminar course for two semesters and attend at least five seminars each semester and attend the CIGP symposium for the grade of S, Satisfactory. Doctoral students need two additional semesters of CLS seminar course – total four semesters. During the final graduation year, doctoral students are required to deliver at least one seminar talk at the CIGP Symposium.

2.2.3 Plan of Study Requirements

Plan of study (POS) is filed with the home department for the student's pursuing degree. To fulfill 'Concentration' field on POS, all successfully completed CLS Courses must be listed on the Plan of Study for auditing purposes. If a master's course is used toward the doctoral degree, it cannot listed on POS and cannot count towards fulfilling CLS curricular requirements.

A CLS concentration code, CMLS, is approved when all the CLS requirements are successfully completed.

2.2.4 CLS Courses Summary

Computational Life Science (CLS) Course Summary	
<i>At least one course must be taken from outside the student's home department (and not cross-listed with the home department)</i>	
Master (total 3 courses)	Doctoral (total 4 courses)
<p><u>Core Biology (select one)</u></p> <ul style="list-style-type: none"> • BCHM 56100/56200 • BIOL - 51700, 54100, 54200, 55000, 57300, 58000, 59500, • MCMP 57000 <p><u>Core Computing (select one)</u></p> <ul style="list-style-type: none"> • BIOL 59500 • BME 59500 • CS - 50100, 51400, 51500, 52500, 53000, 54100, 57300, 54100, 57300, 57900, 61500 • PHYS 57000, 58000 • STAT 598G 	<p><u>Core Biology (select one)</u></p> <ul style="list-style-type: none"> • BCHM 56100/56200 • BIOL - 51700, 54100, 54200, 55000, 57300, 58000, 59500, • MCMP 57000 <p><u>Core Computing (select one)</u></p> <ul style="list-style-type: none"> • BIOL 59500 • BME 59500 • CS - 50100, 51400, 51500, 52500, 53000, 54100, 57300, 54100, 57300, 57900, 61500 • PHYS 57000, 58000 • STAT 598G
<p><u>Relevant Courses (select one)</u></p> <ul style="list-style-type: none"> • Agronomy • Animal Sciences • Biochemistry • Biology • Biomedical Engineering • Chemical Engineering • Chemistry • Computer Science • Electrical and Computer Engineering • Industrial Engineering • Mathematics • Medicinal Chemistry and Molecular Pharmacology • Physics • Statistics 	<p><u>Relevant Courses (select two)</u></p> <ul style="list-style-type: none"> • Agronomy • Animal Sciences • Biochemistry • Biology • Biomedical Engineering • Chemical Engineering • Chemistry • Computer Science • Electrical and Computer Engineering • Industrial Engineering • Mathematics • Medicinal Chemistry and Molecular Pharmacology • Physics • Statistics
<p>To view the list of Proficiency and Foundation Courses, click the links below:</p> <p>https://www.purdue.edu/gradschool/cigp/academics/courses/cls-proficiency.html</p> <p>https://www.purdue.edu/gradschool/cigp/academics/courses/cls-foundation.html</p>	

2.2.5 Timeline Summary for Computational Interdisciplinary Graduate Programs

Semester	Activity
Semester 1	<ol style="list-style-type: none"> 1. Apply CIGP program - CS&E or CLS 2. Receive an official welcoming e-letter and a curriculum guideline 3. Attend First Day Meeting– <i>for all CIGP students</i> <ul style="list-style-type: none"> • Fall and spring semesters only 4. Complete CS&E or CLS courses <ul style="list-style-type: none"> • Pre-planning is highly recommended • Total nine credits for master’s and 12 for doctoral • Grade of B or higher is accepted • Check Core Courses restriction policy 5. Register CS&E/CLS Seminar Course <ul style="list-style-type: none"> • 4 semesters for the doctoral • 2 semesters for the master’s • Attend at least 3 seminars per semester
Semester 2	<ol style="list-style-type: none"> 1. Attend First Day Meeting – <i>for all CIGP students</i> 2. Continue on completing CS&E/CLS courses and the seminar 3. OIGP Spring Reception <ul style="list-style-type: none"> • Office of Interdisciplinary Graduate Programs (OIGP) organizes an annual research event every spring semester. Join the event to present the research; to expand academic experiences; to build connections with students and faculty across the programs 4. Notify CIGP Office if registered as a graduation candidate <ul style="list-style-type: none"> • Receive the final audit and official e-letter of completion • Complete CIGP Exit Survey
Semester 3	<ol style="list-style-type: none"> 1. Attend First Day Meeting – <i>for all CIGP students</i> 2. Continue on completing course requirements – CS&E/CLS courses and the seminar 3. Participate CS&E/CLS events <ul style="list-style-type: none"> • Join CIGP social events, special seminars, luncheons, OIGP Spring Reception, free training workshops, etc. 4. Notify CIGP Office if registered as a graduation candidate <ul style="list-style-type: none"> • Receive an official e-letter of completion • Complete CIGP Exit Survey
Semester 4	<ol style="list-style-type: none"> 1. Attend First Day Meeting – <i>for all CIGP students</i> 2. Continue on completing course requirements – CS&E/CLS courses and the seminar 3. Participate CS&E/CLS events <ul style="list-style-type: none"> • Join CIGP social events, special seminars, luncheons, OIGP Spring Reception, free training workshops, etc. 4. Deliver a seminar talk during the final graduation year– <i>doctoral students only</i> 5. Notify CIGP Office if registered as a graduation candidate <ul style="list-style-type: none"> • Receive official e-letter of completion • Complete CIGP Exit Survey

3. Computational Interdisciplinary Graduate Programs Policy

3.1 Admission

To join Computational Interdisciplinary Graduate Program (CIGP), a student must be enrolled in one of the CS&E or CLS affiliated graduate programs and complete a CIGP registration form. The form is available in a fillable PDF format at <https://www.purdue.edu/gradschool/cigp/about/apply.html>.

CIGP Office reserves all the rights to accept or decline applicants relying on the information of student's academic standing and GPA.

3.2 Courses, Seminars, and Plan of Study

Courses

CIGP has more than 100 approved courses available for the CS&E and 50 for CLS. To fulfill the course requirements, students must select courses from the CIGP approved list and complete CS&E or CLS courses with 3.0 GPA. For an advanced/special topic course, a pre-approval is required from the CS&E or CLS Representative before CIGP Office reviews the request for final decision.

CIGP Office reserves all the rights to accept or decline course requests that are not listed on the CS&E/CLS approved course list.

Grade Requirements

The Graduate School considers a G.P.A. of below 3.00 as performance below that expected of a graduate student and grade reports will so indicate. In addition to the standards set by the Graduate School, a student must complete CS&E/CLS courses with the grade of B or higher (GPA 3.0).

Seminar Registration & Deadline

Seminar course registration is allowed as long as there are more than four seminars left to continue in the semester. Following the Purdue Safety policy, when the class capacity is full, the registration is immediately closed by the schedule deputy.

Seminar Talk

A doctoral student must deliver one seminar talk during the final graduation year. To reserve the seminar talk, student must schedule a seminar talk by contacting the office before the deadline.

First come, first served:

- No seminar course registration is required for the seminar talk.
- Summer graduation candidates should deliver a seminar talk in spring semester.

Plan of Study

The Graduate School allows only one primary concentration on the Plan of Study (POS) for the transcript. If multiple concentrations are pursued, a student must choose the primary concentration for the Plan of Study after consulting a major professor.

Students are required to list coursework under supervision of the major professor. All CIGP students must list all the courses taken in fulfillment of CIGP curricular requirements for auditing purposes.

3.3 Continuing Doctoral Students

When a master's student successfully completes and continues a CS&E or CLS concentration to a doctoral degree, completed CS&E or CLS master's courses cannot be counted toward the CS&E or CLS doctoral courses. Therefore, such students are required to take two more Core Courses and two more Relevant Courses in order to successfully complete the CS&E or CLS program as a doctoral student.

Because of the unique characteristics of the seminar course, CS&E/CLS seminar courses completed for master's degree are not transferable toward the doctoral degree. To meet the seminar requirements, continuing PhD students are required to finish four semesters of the seminar course and deliver a seminar talk during a final graduation year.

3.4 Distance Learning Students

Seminar course requirements are waived for the distance learning students. However, for the doctoral student, a video presentation (15 to 30 minute length) must be submitted to fulfill a seminar talk requirement.

3.5 Guidelines for the Faculty

Faculty Membership

CIGP welcomes new faculty members in computational research fields. To become a CS&E or CLS faculty, a request can be submitted to CIGP Director by email, carbon copying the department CS&E/CLS Representative. For the purpose of CIGP faculty data, a copy of curriculum vita must be submitted to CIGP Office.

Governance Committee

CS&E or CLS Representative for the department is nominated by a faculty member or by the CS&E/CLS Director. By agreeing to the responsibilities of the Department Representative, he or she serves three-year renewable term.

Course Addition/Deletion Policy

CS&E and CLS courses are updated annually to provide an accurate list of active and inactive courses. To add the course, CS&E/CLS faculty can request a course addition by email with the consent of a department representative. For the review and record of CIGP Office, following information must be provided:

- a copy of course syllabus
- course description
- a short paragraph of how the course will benefit CS&E or CLS students

Last day to submit course proposal is each spring semester or by April 1st for the next academic year. On an emergency basis, an urgent request may be handled by the CIGP Director. *CIGP Office reserves all the rights to accept or reject a new course proposal.*

Courses can be deleted at any time by the request of CS&E/CLS faculty if the member ensures it will be no longer offered. Also, any courses that haven't been offered for five years or more will be deleted from the course list. Deleted courses can be added back on the list when it is taught again.