PH.D. PROGRAM IN COMPUTATIONAL SCIENCE

Conducted Jointly
by

San Diego State University
Claremont Graduate University

Revised: August 25, 2017

Degree Designation

The degree shall be designated as the ***Doctor of Philosophy in Computational Science*** and shall be granted at the Claremont Graduate University (CGU) in the name of the two universities in accordance with an agreement between CGU and the San Diego State University (SDSU). The diploma shall specify that it is being granted only when requirements have been satisfied as specified by both collaborating institutions.

Program Supervision and Administration

Overall program supervision will be the joint responsibility of a graduate faculty group at CGU and SDSU. A Program Coordinator, a doctoral faculty member, will be appointed at each campus. The two Program Coordinators will oversee the operation of the program, advise students, appoint preliminary advisors and recommend appointments to Doctoral Committees. However, note that the SDSU Office of Graduate and Research Affairs (GRA) will be the primary administrative office. The GRA will process forms for advancement to candidacy, check program requirements, conduct formal dissertation review services, issue diplomas, and send notices to the students. All this will be done in concert with appropriate units at CGU.

Admission Requirements

Students must be admitted to both institutions jointly. However, students must apply to SDSU first. Admission will be granted to a ***limited number*** of qualified students, and therefore application should be made as early as possible. Applications are encouraged from both men and women, and particularly from members of minority and handicapped groups. Completed applications are due by **February 15** for the Fall semester, although later applications may be allowed at the discretion of the Admissions Committee. The Admissions Committee has the responsibility of deciding admissions, consistent with campus regulations. The admissions review process may include personal interviews of applicants.

To be admitted to the Joint Ph.D. Program, an applicant must have received a baccalaureate degree in a scientific discipline, engineering or economics from an accredited institution. Applications from outstanding candidates with degrees in other areas may be accepted conditionally. Normally, these students will be expected to take, during their first year of enrollment, the necessary coursework to eliminate deficiencies in their background. Moreover, the applicant must have an undergraduate Grade Point Average of at least 3.0, and of at least 3.50 in any previous graduate work. The applicant must, in addition, have attained such a scholastic record and present such confidential recommendations as to indicate that he or she is well qualified to pursue, with distinction, advanced study and research.

*The GRE General is a requirement for admission. Scores on this exam must be less than five years old. Applicants whose first or native language is **not** English are required to have a current minimum score of 550 in the Test of English as a Foreign Language (TOEFL).*

Program Planning

Upon admittance, each student will be assigned a Faculty Mentor from either institution, as appointed by the Program Coordinators. After one year of study with favorable progress, the student will select a Doctoral Advisor (from either CGU or SDSU) and four other persons, two from each campus, to serve on a five-person Doctoral Committee. The selection of the Doctoral Advisor and the Doctoral Committee must be approved by the two Program Coordinators. The Doctoral Committee will then function as the student's official advising unit. The members of this committee will develop a suitable course of study in consultation with the student, administer the Qualifying Exam, monitor research progress, and administer the student's Final Exam (Doctoral Dissertation Defense).

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Plan of Study

After consultation with the Faculty Mentor, the student must prepare and file with the Program Coordinator before the end of the first semester a Plan of Study for completing the course requirements for the degree. The purpose of the Plan is to ensure that the student is aware of the requirements for the degree. The Plan of Study must indicate the areas of study that the student will be taking in preparation for the qualifying examination.

A total minimum of 72 units of course work, independent study, and research (including transfer credit) must be completed. These must be distributed as follows:

- Minimum 24 units of graduate level coursework at SDSU (computational science program).
- Minimum 24 units of graduate level coursework at CGU (graduate mathematics program).
- Minimum 24 units of Research, Practicum, Dissertation and Graduate Seminar at either institution.

Transfer credits of up to 24 units of related computational science courses at the master's level is permissible on approval of the Program Coordinators; this course work must have been completed with at least a grade of B or its equivalent. Both sets of 24 coursework units must conform to the area requirements of the relevant institution and must be approved by the respective Faculty Mentor. All degree requirements must be completed within seven years (or six with the transfer of 24 units according to CGU regulations) from the time a student begins graduate study.

An option (recommended) to satisfy the initial 24-unit requirement is to complete the coursework for the M.S. in computational science at SDSU, and then take 24 units of coursework at CGU. All students are required to demonstrate the level of training in computational science that would be equivalent to the M.S. in computational science at SDSU before continuing in doctoral studies at CGU. Students expecting to continue doctoral studies in computational science must have a recommendation from the Computational Science Director at SDSU certifying that this level of proficiency has been achieved.

The detailed program of study must include the following (number of units in parenthesis):

Required Courses at SDSU (totaling 18 units):

- Mathematical Modeling (3), Math 636
- Scientific Computing (3), COMP 605/CS 605
- Scientific Database Techniques (3), CS 503
- Computational Imaging (3), Comp 589
- Computational and Applied Statistics (3), COMP 604
- Computational Database Fundamentals (3), COMP 607
- Applied Mathematics for Computational Scientists (3), COMP 626
- Seminar: Problems in Computational Science (3), COMP 670
- Advanced Numerical Analysis I (3), Math 693A
- Advanced Numerical Analysis II (3), Math 693B

The additional courses taken to make up the 24-unit requirement at SDSU are electives and are to be chosen in consultation with the student's Doctoral Advisor. The student's program of study beyond the core requirement will be tailored to the student's research interests.

Research Units at SDSU:

- Supervised Research (6), Comp 894, SDSU
- Dissertation Proposal (3), Comp 894, SDSU
- Doctoral Research (18-36), Comp 897, SDSU
- Practicum (3-18) Comp 898, SDSU
- Dissertation (3), Comp 899, SDSU

Note that students are required to be registered for at least 3 units (COMP 899) at SDSU during their final semester prior to graduation. This requirement is essential for obtaining the Ph.D. degree.

Required Courses at CGU (totaling 24 units, each course is 4 units):

Note that for the 6 courses (total 24 units) to be taken at CGU, there is a core course requirement that must be satisfied as follows. Students must select 1 course each from at least 3 of the following 4 categories:

- Discrete Modeling (e.g., Math 389)
- Advanced Statistics with Computation (e.g., Math 341-342, Math 351, Math 352, Math 353, Math 355)
- Advanced Numerical Analysis (e.g., Math 368) or Numerical PDEs (e.g., Math 362)
- Exotic Algorithms (e.g., Math 359, Math 369)

The additional courses taken to make up the 6-course requirement at CGU are electives, and are to be chosen in consultation with the student's Doctoral Advisor. The student's program of study beyond the core requirement will be tailored to the student's research interests.

Research Units at CGU:

- Dissertation Research (2-12), Math 495, CGU
- Independent Research (3-4), Math 498, CGU
- Doctoral Study (0), Math 499, CGU

Note that students are required to be registered for Doctoral Study (Math 499) at CGU during their final semester prior to graduation. This requirement is essential for obtaining the Ph.D. degree.

Qualifying Examination

The student is expected to pass the Qualifying Exam within 2 years of admittance. This examination shall consist of a term research project supervised by a Faculty Mentor. The student will be required to prepare a written account of research work performed and its results, and offer an oral presentation before the members of the Doctoral Committee. The student will use the form entitled "Nomination of the Doctoral Committee for Qualifying Examinations for the Degree of Doctor of Philosophy" (JDP 2) from San Diego State University to nominate Qualifying Examination committee members. The original form will be kept on file at CGU with a copy being kept on file at SDSU. This level of evaluation will be equivalent to the Computational Science M.S. degree Thesis Defense at SDSU. However, the Qualifying Examination shall be distinct from the M.S. degree Thesis Defense. Should a student fail the qualifying exam, one retake will be allowed.

After successful completion of the Qualifying Examination and certification that all other requirements are fulfilled, the student is to complete the appropriate form entitled "Report of the Qualifying Examination for the Degree of Doctoral of Philosophy" (JDP3) from SDSU to record the successful completion of the exam. The original form will be kept on file at CGU with a copy being kept on file at SDSU.

Practicum and Doctoral Research

Dissertation research will be carried out at either CGU or SDSU, or at an industry or national laboratory under the supervision of the Doctoral Advisor.

Dissertation Proposal

The student is expected to submit a Dissertation Proposal to the Doctoral Committee no later than upon completion of the student's third academic year in the program. The Proposal should take the form of a scientific grant proposal to a major funding agency. It should describe the research project that the student intends to carry out or which his/her Doctoral Dissertation will be based. The student must also offer an oral presentation of the Proposal before the Computational Science faculty. Upon successful completion of this presentation, the student will be recommended for Advancement to Candidacy for the Doctoral Degree.

Advancement to Candidacy

After successful completion of the Dissertation Proposal and certification that all other requirements are fulfilled, the student is Advanced to Candidacy. The appropriate form entitled "Report of the Dissertation Proposal and Advancement to Candidacy for the Degree of Doctoral of Philosophy" (JDP4) from SDSU to record the Advancement to Candidacy. The original form will be kept on file at CGU with a copy being kept on file at SDSU. This must occur at least six months before the Final Oral Defense.

Dissertation and Final Oral Examination

On completion of the research, the student will prepare the Dissertation in accordance with CGU regulations. A final draft of the Dissertation will be presented to each member of the Doctoral Committee at least three weeks prior to the final oral examination. Please see the CGU Bulletin for the Final Defense scheduling dates. The oral defense will be held on the campus of the Dissertation supervisor. Following the Final Examination, the student must file the form entitled "Report of the Final Examination and Filing of the Dissertation for the Degree of Doctor of Philosophy" (JDP 5). The original will be sent to SDSU when the dissertation has been filed in the Registrar's Office at CGU. Once completed at SDSU, the originals of these forms will be kept on file at CGU with copies being kept on file at SDSU.

Residency Requirements

Doctoral students must complete their programs in a period of seven years (or six with the transfer of 24 units according to CGU regulations, see below). During this time, a minimum of 72 units of course work, independent study, and research, including transfer credit, must be completed. Normally no more than 16 units per semester may be credited toward the degree. No more than 12 units per summer session may be credited toward the degree.

All degree requirements must be completed within seven years from the time a student begins graduate study. Work for which transfer credit is granted will be counted as part of the seven years, e.g., if transfer credit of 24 units (one year) is granted, the time limit will be six years. The Program Committee will consider petitions for extensions.

The residency requirements for the Ph.D. degree may be met either by two semesters of full-time study in a 24-month period or by the completion of 48 units of course work within a 48-month period, including work in the Summer Session, on either or both campuses.

Students who receive transfer credit for 12 units or less may meet the residence requirement either by completing two full-time semesters of course work within a 24-month period or by completing 36 units within a 48-month period. Those receiving transfer credits for 13 to 24 units may meet the residence requirement by completing 24 units within a 36-month period. The seven-year maximum time period for the Ph.D. degree is reduced by six months for 12 units or less of transfer credit and by 12 months for 13 to 24 units of transfer credit.

At the beginning of each term, notification of who is enrolled will be sent from SDSU to CGU and vice-versa so that all enrolled students will continue to have access to libraries and other facilities.

In order for students to have access to health insurance and libraries at both institutions, the student will need to obtain current registration stickers from the respective schools for each term they're enrolled.

At the end of each semester, transcripts will be sent from SDSU to CGU for those students completing work at San Diego and also sent from CGU to SDSU for students completing work at Claremont.

If students fall below the minimum GPA requirements as set forth by CGU while studying at SDSU, SDSU will notify CGU immediately.

Policies and Procedures

1. Throughout their entire program of study, unit-taking students must be registered at **either** CGU or SDSU. Students who intend not to take course units at either institution, including those who have finished their course units, must take the necessary steps to maintain continuous enrollment. **This is achieved by registering for M499 Doctoral Study at Claremont Graduate University.** Requests for leaves of absence must be submitted to each Registrar's Office and approved by both institutions according to the standards of each, and upon approval of leave should advise the Math Office at CGU and the Computational Science Research Center at SDSU. Contact each Registrar's Office for leave of absence policies. Approvals of leave of absence will be reported both from CGU to SDSU and from SDSU to CGU to assure that all leaves have been reported. **If you fail to advise the Registrar at CGU of your leave granted by SDSU, you will be dropped from the program.** If this happens you will have to pay a fee to be reinstated at CGU, plus pay the regular tuition when you return. At both institutions, leaves of absence are approved for two consecutive semesters only. Leaves for longer than one year will result in the student being dropped from the program. If this happens you will have to re-apply for admission with the approval of the program director.

2. International students registered for units at SDSU must provide the CGU International Student Advisor with proof of registration within two weeks of the beginning of the semester at CGU. Proof of full-time registration is required to maintain immigration status.

3. Students should arrange for a Faculty Mentor, either one in math at CGU or one in computational science at SDSU, at the earliest opportunity. The program coordinators will help provide Faculty Mentors.

4. After consultation with their mentors, students must submit a plan of study, including a petition for transfer of credits, if applicable, during their first year of study. The plan of study must be approved and transfer of units recommended to the Registrar by the program coordinators.

5. Students admitted to provisional status must provide the materials needed to complete their files before the end of their first semester of enrollment. Official scores for the GRE General Test are required of all students before admission to full graduate standing. The admissions committee will review completed files for change of status.

6. The academic progress of students admitted to conditional status will be reviewed by the admissions committee prior to a decision about change of status.

Procedures for Student Admission

1. Students must complete application forms for both CGU and SDSU, and submit the $55 application fee to SDSU. In addition, they are required to supply transcripts and current (i.e., not more than 5 years old) official GRE scores (on Q, A and V) for admission. Please contact ETS and have scores sent to SDSU (code: 4682). International Students who have not earned a U.S. degree must submit TOEFL scores to SDSU as well.

2. **Completed online applications (and fee for SDSU)** are to be submitted to the **SDSU Graduate Admissions Office**, San Diego State University, through Cal State Apply application system.

3. **Completed online applications of supplemental documents** (CV, statement of purpose, 3 letters of recommendation, JDP Application, and CGU Application) are to be submitted to the **Computational Science Research Center**, San Diego State University, through Decision Desk application system.

4. A complete file is reviewed by the SDSU members of the Joint Ph.D. Admissions Committee. In the event of a negative review, a denial letter is issued by SDSU.

5. A positive review by SDSU sets up the following steps. The application forms, copies of the transcripts and recommendation letters are sent by SDSU Computational Science Research Center to the CGU Department of Mathematical Sciences, in care of: Charlotte Ballesteros, Admissions Coordinator, 160 E. Tenth Street, Claremont, CA 91711. The Director of the Computational Science Program at CGU, and the CGU members of the Joint Ph.D. Admissions Committee then review the application in consultation with professors in the appropriate discipline. Results of this review are transmitted to SDSU Computational Science Research Center (c/o Parisa Plant). If the student is admitted, both institutions will send an admit letter and CGU's letter will contain a reply/decision card that the student can complete and return once they have made their decision about enrolling in the program. A negative review by CGU initiates a denial letter from CGU.

Notes:

A. The SDSU Graduate Admissions office, regularly and routinely, informs students of the status of their application through the online Student Web Portal. Missing items are noted.

B. Since only complete files are transmitted from SDSU to CGU, information on the status of a file is available only from SDSU (Parisa Plant, Computational Science Research Center, College of Sciences, San Diego State University, 5500 Campanile Drive, San Diego, CA 92182-1245, Phone 619-594-3430, Fax 619-594-2459).

C. In the event of rejection it may be worthwhile to note reasons in the files.

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D. For any SDSU information relating to the Joint Doctoral Program, please contact Parisa Plant at the address in part B above.

Honor Code

1. I will respect the intellectual property of others, giving credit for ideas or information where credit is due. When appropriate, I will compensate others for the use of their ideas or intellectual property.

2. I will respect copyright laws and software licenses; particularly, when completing course assignments or department requirements.

3. While I am encouraged to work with other students currently in our program, I am expected to turn in my own work. I am not allowed to consult with students who have taken previous offerings of the courses I am taking for assistance with homework assignments. Also, I need to consult with both instructors if I want to use part of a project for more than one course. The submission of work originating from previous semesters is considered to be a serious honor code violation.

4. In preparing assignments and response to examinations, I will follow the policies provided by the department and its professors. When I do not understand the policies governing an assignment or exam, I will seek clarification.

5. Unless there are clear policies to the contrary, I will not seek information about the content of course exams, will not disclose such information to others, and will not seek or provide assistance to others in the completion of exams challenges or questions.

6. When communicating with department personnel about my status as a student, my program of studies, or my coursework, I will honestly represent my understanding of relevant circumstances, for example, whether I have (or have not) completed course prerequisites or filed specific paperwork.

7. I will take reasonable efforts to stay informed of SDSU policies regarding plagiarism, cheating, and software use. In particular, I will read the University's Statement of Student Rights and Responsibilities (http://www.sa.sdsu.edu/srr/conduct1.html).

(Adapted from SDSU's EDTEC Honor Code)