

**JOINT DOCTORAL PROGRAM  
IN  
ENGINEERING AND  
INDUSTRIAL APPLIED MATHEMATICS**

**Conducted by  
California State University, Long Beach,  
and Claremont Graduate University**



**STUDENT HANDBOOK**

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# Joint Doctoral Program in Engineering and Industrial Applied Mathematics

## Introduction

The doctoral program in Engineering and Industrial Applied Mathematics is a joint program between the College of Engineering (COE) at California State University, Long Beach (CSULB), and the School of Mathematical Sciences at Claremont Graduate University (CGU). This program was approved by the CSULB Senate in 1987 and granted its first doctoral degree in 1995.

The Joint Doctoral Program was created with two educational goals that continue to be pertinent today:

- Develop a doctoral program that seeks to judiciously combine the applied mathematics field with one or more branches of engineering at both the academic and research level.
- Draw upon the synergistic expertise of the research faculty at both institutions to offer an interdisciplinary degree that integrates advanced techniques of mathematical analysis with advanced engineering coursework and research.

The program's key objective is to facilitate an individually designed program for each student in an interdisciplinary setting for advanced study and research. The College of Engineering at CSULB has the primary responsibility for the engineering portion of the program; the School of Mathematical Sciences at CGU has the primary responsibility for the applied mathematics portion. The program of study for each Ph.D. candidate is carefully integrated to ensure the interdisciplinary nature of each student's research.

## ***Degree Designation***

In accordance with an agreement between CGU and CSULB, the degree is designated the ***Doctorate of Philosophy in Engineering and Industrial Applied Mathematics*** and is granted at Claremont Graduate University in the name of the two universities. The diploma indicates the dual nature of the degree and specifies that it is granted only when requirements have been satisfied in both subject areas as specified by the collaborating institutions.

## ***Program Supervision***

Overall program supervision is the responsibility of the **Program Committee**, consisting of the directors of the Joint Doctoral Program (JDP) from each institution, the Dean of Mathematics at CGU, and the Dean of Engineering at CSULB.

## **Admission Requirements**

Students must be admitted to both institutions jointly. Admission will be granted to a limited number of qualified students; therefore, application should be made as early as possible. Applications are encouraged from both men and women, particularly from members of minority groups or individuals with disabilities. Completed applications

must be received by **April 1 for the fall semester** or **October 1 for the spring semester**, although late applications are allowed at the discretion of the Program Committee. The Program Committee is responsible for making admission decisions consistent with campus regulations (see Application Procedure in this booklet).

To be admitted to the Joint Doctoral Program, an applicant must have received a bachelor's or master's degree in science, engineering, or mathematics from an accredited institution. Moreover, he or she must have attained scholastic records and present confidential recommendations, which indicate that he or she is well qualified to pursue, with distinction, advanced study and research. Be advised that admission may be refused solely on the basis of limited facilities in the option desired.

### ***GRE Requirement***

The analytical, verbal, and quantitative portion of the Graduate Record Examination (GRE) is required before admission. GRE subject examinations (mathematics and engineering) are not required. Applicants whose first or native language is **not** English are required to have a **current** minimum score of 550 (213 on the new scale) on the *Test of English as a Foreign Language* (TOEFL); however, this requirement is waived for students with a bachelor's or master's degree from an accredited U. S. university.

### **Registration and Enrollment**

It is important that students register and enroll in classes each semester at either CGU or CSULB. Failure to enroll at any given semester will be considered leave without permission (discontinued enrollment) and the student will be dropped from the program.

### ***Program Planning and Supervision***

At CSULB, an initial engineering advisor is assigned to the student at the time of admission. At CGU, the student needs to arrange with the program director, within the first semester of study, for a mathematics advisor. The student's program of study is arranged individually in collaboration with their advisors; the two advisors confer periodically regarding the student's progress. The Program Committee monitors the student's overall performance.

### **Course Work and Examinations**

A minimum 72 units of course work, independent study, and research (including transfer credit) must be completed. Transfer credit of up to 24 units of related courses at the master's level is permissible on approval of the Program Committee; this course work must have been completed with at least a grade of B or above, at an accredited institution, and must be directly related to the joint program and the student's goals. Of the 72 units, a minimum of 24 units must be completed in the graduate engineering program at CSULB and a minimum of 24 units in the graduate mathematics program at CGU. Both sets of 24 units must conform to the area requirements of the relevant institution and **must be approved by the Program Committee**. 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.

Every doctoral student must maintain a cumulative grade-point average (GPA) of 3.0 and a grade-point average of 3.0 in all courses applicable to the degree. Furthermore, students must earn at least a grade of B or above in any course that is counted towards the course work requirement. Students are put on academic probation if they fail to maintain a cumulative or term GPA of at least 3.0 in all units attempted subsequent to admission to the degree program. After two consecutive semesters on probation, students are subject to disqualification if they fail to earn sufficient grade-points to be removed from the probationary status.

### ***CSULB Course Requirement***

The only specific CSULB course requirement is four units of **Engineering 796: Doctoral Seminar (2)**. The remaining 20 units, for students who have received transfer credit, may include courses needed for the Preliminary Examinations (see the Preliminary Examination section of this handbook), Doctoral Dissertation, Advanced Special Topics, and Advanced Directed Studies. Presently, students are permitted to count the following courses in addition to the regular graduate courses, offered by the five engineering departments, towards meeting the CSULB 24-unit course requirement.

- ENGR 790: Advanced Special Topics in Engineering (8 units allowed)
- ENGR 795 or MAE 795: Advanced Directed Studies (8 units allowed)
- ENGR 796: Doctoral Seminar (4 units required)
- ENGR 798 or MAE 798: Doctoral Dissertation (4 units allowed)

### ***Minimum Student Load per Semester***

It is **highly recommended** that doctoral students enroll in at least 9.0 units per semester in order to demonstrate progress towards the degree. The CSULB director of the program, in consultation with the doctoral advisor, **may require** that a student take at least 9.0 units per semester if the student is not showing adequate progress.

These courses may include the following:

- ENGR 797A: Preparation for Ph.D. Preliminary Examinations
- ENGR 797B: Preparation for Ph.D. Qualifying Examination

Students may take from 4.0 to 12.0 units of ENGR 797A or ENGR 797B each semester, **though these courses may not be used to fulfill the 72-unit course work.** Both of these courses are offered on Credit/No Credit bases and are designed to formally recognize the students' efforts towards the program.

### ***Residency Requirements***

Doctoral students must complete their program within 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. The transfer of credit form is available on the CGU website.

The Program Committee will consider petitions for extensions and/or exemptions.

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 residency requirements for the Ph.D. 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). There are special provisions for students transferring units as described below.

Students who receive transfer credit for 12 units or less may meet the residency 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 credit for 13 to 24 units may meet the residency 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.

### ***Plan of Study***

After consultation with their advisors, students are **required**, before the end of the first year, to prepare and file with the Program Committee a Plan of Study for completing the course requirements for the degree. The purpose of the Plan of Study is to ensure that the student is aware of the requirements for the degree. The Plan of Study should indicate the areas of study that the student will be taking in preparation for the preliminary examinations. In consultation with the student's advisor and Program Committee, the Plan of Study may be altered at a subsequent time by petition.

If a student withdraws from the program after completing a substantial portion of the course work, a master's degree at either or both institutions is still possible by satisfaction of the appropriate requirements. Both CGU and CSULB require 30-36 semester units of course work for master's degrees.

### ***Preliminary Examinations***

The student is required to pass written preliminary examinations. These examinations consist of four examination areas: **two in engineering** and **two in mathematics**. These examinations should be taken **immediately** after completion of the relevant course work at each institution. These examinations are given two or three times a year at the discretion and under the control of the Program Committee. Should a student fail an examination, they may petition the Program Committee for one retake.

Before taking the first preliminary examination, the student **is required** to complete the Preliminary Examination Permission Form (available at the CSULB website, [www.csulb.edu/colleges/coe](http://www.csulb.edu/colleges/coe), or at the CGU site, [www.cgu.edu/math](http://www.cgu.edu/math)). This form requires the student to specify the four areas of the Preliminary Examination; the student's intended dissertation advisor and the directors of the Joint Doctoral Program must sign it. The purpose of this form is to certify that the student and dissertation advisor are in agreement on the set of examinations. If, in the course of time, this set of

examinations and/or the advisor is amended, the form must be resubmitted. The preliminary examinations are considered completed when the four examinations specified on the student's form have been successfully passed. You must be enrolled at CSULB (e.g., enrolling in at least 4.0 units of 797A) in order to take the CSULB portion of the Preliminary Examinations.

### ***CSULB College of Engineering Preliminary Examinations***

The College of Engineering requires a minimum of **two graduate courses** (graded B or above) as a basis for each Preliminary Examination. With the consent of their dissertation advisor, students may select **two topics from the list below**. With the permission of their dissertation advisor and the CSULB director of Joint Doctoral Program, they may also designate other topics for their Preliminary Examination.

#### ***Chemical Engineering Topics:<sup>1</sup>***

- Chemical Engineering Science (minimum of two courses)
  - CHE 530: Advanced Reactor Kinetics
  - CHE 565: Biochemical Engineering
  - CHE 585: Air Pollution
- Applied Engineering Mathematics (minimum of two courses)
  - CHE 520: Advanced Transport Phenomena
  - CHE 560: Advanced Chemical Process Control
  - CHE 580: Theoretical Methods in Chemical Engineering

#### ***Civil Engineering Topics:<sup>2</sup>***

- Construction Engineering Management (minimum of two courses)
  - CE 573: Engineering Specifications, Law and Contracts
  - CE 574: Method Analysis and Design of Construction Operations
  - CE 576: Construction Organization and Management
- Environmental Engineering (minimum of two courses)
  - CE 565: Environmental Waste Engineering
  - CE 566: Unit Operations in Environmental Engineering

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<sup>1</sup> CHE 697, Directed Research, may be used as a substitute with the permission of the doctoral advisor.

<sup>2</sup> CE 504, Advanced Topics in Civil Engineering, may be used as a substitute with the permission of the doctoral advisor.

- Geotechnical Engineering (minimum of two courses)
  - CE 546: Theory and Design of Foundation Structures
  - CE 547: Soil Dynamics
  - CE 740: Mathematical Modeling in Geotechnical Engineering
- Structural Engineering (minimum of two courses)
  - CE 502: Finite Element Methods II
  - CE 555: Seismic Design II
  - CE 557: Advanced Structural Analysis
- Transportation Engineering (minimum of two courses)
  - CE 526: Pavement Engineering
  - CE 529: Traffic Engineering
  - CE 629: Traffic Operations
- Water Resources (minimum of two courses)
  - CE 536: Urban Surface Water Management
  - CE 538: Hydraulic Engineering Design II
  - CE 630: Mathematical Modeling in Hydraulic Engineering

***Computer Engineering and Computer Science Topics:*<sup>3</sup>**

- Computer Architecture (minimum of two courses)
  - CECS 530/630: Advanced Computer Architecture
  - CECS 531/631: Advanced Computer Architecture II
  - CECS 564/646: Fault Tolerant Computer Systems
- Software Engineering (minimum of two courses)
  - CECS 543/643: Advanced Software Engineering
  - CECS 544/644: Software Testing and Verification
  - CECS 545/645: Software Architecture
- Networking and Distributed Systems
  - CECS 572/672: Advanced Computer Networking
  - CECS 574: Topics in Distributed Computer Systems

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<sup>3</sup> CECS 690, Special Topics in Computer Science, may be used as a substitute with the permission of the doctoral advisor.

- Operating Systems
  - CECS 526/626: Advanced Operating Systems
  - CECS 570/670: Concurrent Parallel Programming
- Artificial Intelligence (minimum of two courses)
  - CECS 550/650: Pattern Recognition Using Artificial Intelligence
  - CECS 551/651: Advanced Artificial Intelligence
  - CECS 553/653: Machine Vision
- Algorithms and Computer Science Theory
  - CECS 528/628: Advanced Analysis of Algorithms
  - CECS 590/690: Special Topics in Computer Science
- Simulation and Modeling
  - CECS 528/628: Advanced Analysis of Algorithms
  - CECS 552/652: Computer Simulation and Modeling

***Electrical Engineering Topics:<sup>4</sup>***

- Biomedical Systems
  - EE 506/606: Theory and Practice of Biomedical Instrumentation
  - EE 507/607: Advanced Biomedical Systems
- Communication Systems (minimum of two courses)
  - EE 580: Statistical Communication Theory
  - EE 581: Satellite Communication Systems
  - EE 582: Spread Spectrum Communication Systems
- Controls and Robotics (minimum of two courses)
  - EE 511: Linear Systems Analysis
  - EE 574: Robot Dynamics and Control
  - EE 575/675: Non-Linear Control Systems
- Digital Signal Processing (minimum of two courses)
  - EE 527: Digital Filter Design and Audio Processing
  - EE 585/685: Advanced Digital Signal Processing
  - EE 586: Real-time Digital Signal Processing

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<sup>4</sup> EE 590, Special Topics in Electrical Engineering, may be used as a substitute for appropriate topics with the permission of the doctoral advisor.

- Digital Signal Processing— Speech (minimum of two courses)
  - EE 528: Speech Signal Processing
  - EE 576: Neural Networks and Fuzzy Logic
  - EE 591: Adaptive Systems
- Digital Communication Networks and Systems (minimum of two courses)
  - EE 540: Advance Digital System and Computer Architecture
  - EE 545: Computer Communication Networks
  - EE 548: Wireless and Mobile Networks and Security
- Digital Electronics
  - EE 531: CMOS Electronics
  - EE 535: VLSI Design
- Systems Engineering
  - EE 502: Engineering Modeling and Simulation
  - EE 503: Advanced Systems Engineering
- Networks and Filters
  - EE 509: Network Theory
  - EE 510: Circuit Synthesis
- Optical Electronics (minimum of two courses, must include EE 533/633)
  - EE 533/633: Quantum and Optical Electronics
  - Physics 540A: Graduate Electricity and Magnetism and Electrodynamics
  - Physics 550A: Quantum Mechanics I
- Power Systems and Power Electronics (minimum of two courses)
  - EE 551: Theory and Applications of DC/DC Converters
  - EE 552: Electric Drives and Applications
  - EE 553: Protection of Power Systems
- Quantitative Methods
  - EE 503: Advanced Systems Engineering
  - EE 505: Advanced Engineering Mathematics for EE

***Engineering Topics:***

- Transportation and Logistics (minimum of two courses)
  - EE 502: Engineering Modeling and Simulation

- EE 503: Advanced Systems Engineering
- ENGR 532: Logistics Principles and Practice

***Mechanical and Aerospace Engineering Topics:<sup>5</sup>***

- Aerodynamics and Computation Fluid Dynamics
  - MAE 635/735: Computational Fluid Dynamics II
  - MAE 637: Advanced Fluid Dynamics II
- Aerospace Structures and Materials
  - MAE 669: Design of Composite Structures
  - MAE 672: Stress Analysis in Design
- Materials, Mechanics and Design and Manufacturing (minimum of two courses)
  - MAE 512/612: Computer Aided Design in Mechanical Engineering
  - MAE 663/763: Nonlinear Optimized Structures
  - MAE 672: Stress Analysis in Design
  - MAE 673: Theory of Elasticity and Plasticity
- Engineering Management
  - MAE 505: Quantitative Methods for Engineering Managers
  - MAE 507: Engineering Project Management
- Quantitative Methods
  - MAE 501: Engineering Analysis I
  - MAE 502: Engineering Analysis II

***CGU School of Mathematical Sciences Preliminary Examinations***

Preliminary examinations in mathematics for the joint program may be chosen from single courses of sufficiently advanced level. These include Math 273, Math 282, and courses numbered 3XX. It is also possible for a preliminary examination to be based on material from two courses at a beginning graduate level, e.g. Math 251/252 or Math 251/256.

***Research Tool***

Students in the Joint Doctoral Program must demonstrate proficiency in problem-solving ability using computer programs. This demonstration may take different forms

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<sup>5</sup> MAE 690, Advanced Topics in Mechanical and Aerospace Engineering, may be used as a substitute with the permission of the doctoral advisor.

depending on the student's engineering sub-discipline, but must include evidence that the student has used an appropriate computer language and an algorithmic method to solve a problem from an engineering discipline.

## **Research and Dissertation**

Upon completion of at least 48 units of course work (including transfer units), the preliminary examinations, and the research tool requirement, a student embarks on the research phase of the Joint Doctoral Program. In preparation for the research phase, the student is expected to spend at least a semester in advanced graduate courses, seminars, or directed reading courses where exposure to research material is emphasized. From these and other sources, the student gains the ability to understand the motivation for research in engineering and applied mathematics and learns to apply research techniques.

### ***Doctoral Committee***

During entry to the program and through the period of the main body of course work at CGU and CSULB, the Program Committee will monitor the student's progress. Upon successful completion of the preliminary examinations, the student petitions the Program Committee to constitute the Doctoral Committee. The student chooses this committee with advice from the faculty advisor and with approval of the Program Committee. The committee must include at least **two faculty members each from CGU and CSULB**; it must also provide breadth and depth in mathematics and engineering in the chosen faculty members. The Doctoral Committee supervises the student's progress through research preparation and dissertation writing; it also administers the qualifying and oral examinations for the degree. The chair of the Doctoral Committee is the dissertation supervisor.

### ***Research Proposal and Qualifying Examination***

With these advanced courses as background, and with the guidance of the Doctoral Committee, the student defines an area of proposed research and prepares a written Dissertation Proposal containing an outline of the research to be undertaken and references to relevant source materials. **The Dissertation Proposal is presented to the Doctoral Committee at least two weeks prior to the Qualifying Examination.** The appropriate form under "Doctoral Degree Forms" can be obtained from the CGU website [www.cgu.edu](http://www.cgu.edu) (under Current Students, Registrar Information). The Qualifying Examination is an oral presentation to the Doctoral Committee describing the planned research. The student is expected to present evidence both as to the mathematical content and to the engineering application of the proposed research, supporting such evidence with references to previous research in both areas. The Doctoral Committee judges the fitness and quality of the Dissertation Proposal from this presentation and from the written proposal. It subsequently communicates its recommendations to the Program Committee. Only upon a positive recommendation may the student embark on a dissertation. In the event of failure, the qualifying examination may be retaken once after petition to the Program Committee.

### ***Advancement to Candidacy***

After successful completion of the Qualifying Examination and certification that all other requirements are fulfilled, the student is advanced to candidacy. The appropriate form under "Doctoral Degree Forms" may be obtained from the CGU website. This must occur at least six months before the Final Oral Defense.

### ***Dissertation and Final Oral Examination***

Upon 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. The appropriate form under "Doctoral Degree Forms," along with an abstract of the dissertation, must be filed with CGU's Office of Admission and Records three weeks before the exam. This deadline is very strict and no exceptions will be made. Please see the CGU website under "Academic Calendar" for the final defense scheduling dates. The oral defense will normally be held on the campus of the dissertation supervisor.

## Research in the CGU/CSULB Joint Doctoral Program

### *Research in the CSULB College of Engineering*

The College of Engineering offers courses in Engineering, Chemical Engineering, Civil Engineering and Construction Engineering Management, Computer Engineering and Computer Science, Electrical Engineering, and Mechanical and Aerospace Engineering. Doctoral students may select courses from one or more of these departments as described later in the handbook.

Presently, the college has about sixty faculty members who teach and conduct research on a wide range of engineering and scientific areas including:

- Aerospace
  - Artificial Intelligence
  - Bioengineering /Biomedical Engineering
  - Circuit Design
  - Communication Systems
  - Control Systems
  - Data Analysis and Systems
  - Education
  - Energy & Environment
  - Forecasting
  - Information Technology
  - Information Security
  - Materials and Structures
  - Military Topics
  - Occupational Management
  - Operations Research Production & Manufacturing
  - Quality
  - Reverse Engineering
  - Risk Analysis
  - Robotics
  - Systems Analysis
  - Transportation & Logistic
- 
- The College of Engineering also supports several research centers and programs:<sup>6</sup>
  - Center for Aerospace Technology in Support of the Aerospace Industry (CATSAI)
  - Center for the Commercial Deployment of Transportation Technologies (CCDoTT)
  - Center for Electronic Design Automation (CEDA)
  - Center for Advanced Logistics Management Systems (CALMS)
  - Center for Energy and Environment Research and Services (CEERS)
  - Center for Excellence in Construction (CEC)
  - METRANS, a joint USC/CSULB center

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<sup>6</sup> For more information on these centers visit [www.csulb.edu/colleges/coe/views/Research\\_Centers.html](http://www.csulb.edu/colleges/coe/views/Research_Centers.html)

## **CSULB Doctoral Faculty**

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• Ömer Benli	Logic-based methods in optimization and analysis; design of supply chain & logistics systems; theory of machine scheduling; applied mathematical Programming	obenli@csulb.edu 562.985.7696
• Eric Besnard	Space Systems, Launch Vehicles, Liquid Propulsion, Computational Fluid Dynamics, Aerodynamics, Optimization	besnarde@csulb.edu 562.985.5442
• Anastasios Chassiakos	Control Systems, Neural Networks, Structural Control, Structural Health Monitoring, Intelligent Control, Intelligent Transportation Systems, Port Operations	achassk@csulb.edu 562.985.4278
• Hsin-Piao Chen	Finite Element Analysis, Aerospace Structures, Composite Structural Analysis & Design, Structural Design Optimization, Damage Detection, Structural Optimization, Genetic Algorithms, Neural Networks	hsinchen@csulb.edu 562.985.1504
• Christopher Druzgalski	Biomedical and clinical engineering - selected topics; acoustics and bioacoustics, sensors, data acquisition systems, and computer graphics for medical and industrial applications, telemedicine and Internet applications	druz@csulb.edu 562.985.8054
• Burkhard Englert	Distributed Systems, Computing Security, Cryptography, Distributed Algorithms	benglert@csulb.edu 562.985.7987
• Fumio Hamano	Control theory, computer vision, and robotics	fhamano@csulb.edu 562.985.7580
• Hamid Hefazi	Aerodynamics, Hydrodynamics, Manufacturing Technologies, Computational Fluid Dynamics, Optimization, Numerical Methods	hefazi@csulb.edu 562.985.1502

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<b>Faculty</b>	<b>Area of Research</b>	<b>Contact Information</b>
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• Rajendra Kumar	Communication Systems, Digital Signal Processing, Adaptive Systems, Global Positioning Systems, Simulation, Mathematical Modeling	kumar@csulb.edu 562.985.1556
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• Dar-Biau Liu	Software Engineering and Ada Technology, Distributed Computer Systems and Networking, Dynamic Task Scheduling	liu@csulb.edu 562.985.1594
• Hassan Mohamed-Nour	Power System Modeling, Energy, Power System Analysis, High Voltage Engineering, Energy Conversion	nour@csulb.edu 562.985.1515
• Tulin Mangir	Networks and Security, Dependable Systems, System on Chip (SOC), Networks on Chip (NOC), Mobile, Wireless, Adhoc Networks, Systems Methodology	temangir@csulb.edu 562.985.5774
• Khosrow Moshirvaziri	Engineering Optimization, Mathematical Modeling and Simulation, Transportation, and Stochastic Process	moshir@csulb.edu 562.985.7965
• Ortwin Ohtmer	Finite Element Methods, 3D-Computer-Aided-Design (CAD), Optimization Techniques	orohtmer@csulb.edu 562.985.1518
• Emily Parentela	Transportation Safety, Transportation Modeling, Geographic Information Systems-based Modeling, and Transportation Risk Assessment	parent@csulb.edu 562.985.4932

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Faculty	Area of Research	Contact Information
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• Alfonso Rueda	Quantum Vacuum and Its Applications	arueda@csulb.edu 562.985.1514
• Antonella Sciortino	Water Resources, Groundwater Flow and Contaminant Transport Modeling, Vadose Zone Modeling, Inverse Modeling for Parameter Estimation, Optimization Techniques for Groundwater and Contaminant Transport Problems	asciorti@csulb.edu 562.985.5119
• Tariq Shehab	Automation in Construction, Management Information Systems in Construction, Development of Intelligent Systems, Inspection, Rehabilitation and Construction of Infrastructure Facilities	shehab@csulb.edu 562.985.1643
• Chit-Sang Tsang	Communication Systems, Digital Signal Processing, Satellite Communication System, Speech Signal Processing, Neural Networks, Fuzzy Logic	ctsang@csulb.edu 562.985.1517
• Mahmoud Wagdy	Microelectronic Circuits and Systems, Analog Signal Processing	wagdy@csulb.edu 562.985.5110
• Henry Yeh	Digital Signal Processing, Digital Communication, Adaptive Beam-Forming, Real-Time DSP Implementation	heyeh@csulb.edu 562.985.4899
• Hsien-Yang Yeh	Fracture Mechanics, Composite Materials, Reliable Design, Mathematical Modeling, Failure Analysis	hyyeh@csulb.edu 562.985.4611

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## **Research in the CGU School of Mathematics**

The graduate curriculum in mathematics is supported by the six mathematical departments in the Claremont Colleges Consortium: Claremont Graduate University, Claremont McKenna College, Harvey Mudd College, Pitzer College, Pomona College, and Scripps College. There are currently about fifty full-time faculty members in the six departments. A broad spectrum of courses in the mathematical sciences is offered, including: algebra, topology, geometry, analysis, numerical analysis, ordinary and partial differential equations, probability, statistics, and many specialty areas (see <http://www.cgu.edu/pages/628.asp> for a full list of courses).

Applied mathematics is the focus of much of the faculty and graduate student research; these topics include applications in physics (semi-conductors), engineering (continuum mechanics), financial engineering, computational molecular biology and bioinformatics, satellite navigation, and computational fluid dynamics. All aspects (modeling, analysis, numerical) are treated.

The School of Mathematical Sciences at CGU also supports

- The CGU Mathematics Clinic
- The Claremont Research Institute of Applied Mathematical Sciences (CRIAMS)

Both of these centers organize research projects for industrial clients.

## **CGU Doctoral Faculty**

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<b>Faculty</b>	<b>Area of Research</b>	<b>Contact Information</b>
• Ellis Cumberbatch	Modeling, PDEs, Asymptotics, Continuum Mechanics	ellis.cumberbatch@cgu.edu 909.607.3369
• John Angus	Probability, Statistics, Mathematical Finance, Algorithms and Computational Science, Reliability and Fault Tolerance, Engineering Applications	john.angus@cgu.edu 909.607.3376
• Ali Nadim	Applied Mathematics, Fluid Dynamics, Scientific Computing	ali_nadim@kgi.edu 909. 607.9413
• Alpan Raval	Computational Biology, Applied Differential Geometry, Stochastic Processes, Quantum Field Theory	alpan_raval@kgi.edu 909.607.3352
• Henry Schellhorn	Mathematical Finance, Operations Research, Mathematical Economics	henry.schellhorn@cgu.edu 909.607.4168

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A complete listing of the Extended Faculty at the Claremont Consortium is available at [www.cgu.edu/pages/321.asp](http://www.cgu.edu/pages/321.asp)

## Policies and Procedures

1. Throughout their entire program of study, unit-taking students must be registered at either CGU or CSULB. Students, who intend not to take course work at either institution, including those who have finished their required units, must take the necessary steps to maintain continuous enrollment. **This is achieved by registering for Math 499 (Doctoral Study) at Claremont Graduate University or by registering for Engineering 798 (Doctoral Dissertation) at California State University, Long Beach. At least two semesters of registration for Math 499 at CGU must be maintained during the last year prior to graduation.** In order for the degree to be conferred, a student must meet all regulations as stated in the CGU Bulletin under “Degree Regulations.”

Requests for **leave of absence** must be submitted to each registrar’s office and approved by both institutions according to the standards of each; upon approval of leave the student should advise the math office at CGU and the office of the Joint Doctoral Program at CSULB. Students should contact each registrar’s office for leave of absence policies. If the student fails to advise the registrar at CGU of his/her leave granted by CSULB, he/she will be dropped from the program (CGU has no official arrangement for leaves). Upon return, the student will be required to pay CGU a reinstatement fee in addition to regular semester tuition.

2. International students registered for units at CSULB must provide the CGU International Student Advisor, Nusha Shishegar, with proof of registration within two weeks of the beginning of the semester at CGU. Proof of full-time registration (8 units minimum) is required to maintain immigration status. (In the circumstance of completion of units, registration in Doctoral Study, CGU Math 499, is required.)
3. Students should arrange for advisors, one in math at CGU and one in engineering at CSULB, at the earliest opportunity. The program committee will help provide advisors.
4. After consultation with their advisors, 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 committee.

## Procedures for Student Admission<sup>7</sup>

1. Students must complete application forms for both CGU and CSULB. The completed application package must include official transcripts, three letters of reference (preferably on the forms supplied in the CGU package), a personal statement and a resume. Current, official GRE scores are required. Scores may not be older than 5 years.
2. The completed application package (including a separate Long Beach fee and application) must be submitted to the CGU Admissions Office, 160 East Tenth Street, Claremont, CA 91711-6163. Do not send application materials to CSULB as this will result in considerable delay. Both application fees are required
3. Online applications are acceptable for the Joint Program; however, consult the Program Advisors at CGU and CSULB for appropriate procedures.
4. The CGU director of the CSULB/CGU Joint Doctoral Program, Ellis Cumberbatch, reviews completed files. In the event of a negative review, a rejection letter is issued by CGU. In the event of a positive review, the application, along with a copy of the completed file, is forwarded to the CSULB director of the CSULB/CGU Joint Doctoral Program, Dr. Mahyar Amouzegar.
5. Results of the Long Beach review are transmitted back to CGU Math. Upon a positive review by CSULB, the application and fee are sent to the CSULB Admissions Office to be processed. A negative review initiates a rejection letter from CGU.
6. Upon admission to the program, CGU will generate two admission letters; one is mailed to the student and one is sent to CSULB. This letter includes a decision card and specifies a required \$200 tuition deposit that should be submitted to CGU if the student chooses to accept the offer of admission.
7. 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 joint faculty program committee will review completed files for change of status.
8. The academic progress of students admitted to **conditional status** will be reviewed by the program committee prior to a decision about change of status.

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<sup>7</sup> Please note that only completed files are transmitted from CGU to CSULB. Information on the status of a file is available only from CGU's Office of Admission and Records. Their contact telephone number is (909) 607-0434; their e-mail is [admiss@cgu.edu](mailto:admiss@cgu.edu).

# CSULB Faculty Research

**Mahyar Amouzegar**

PhD: UCLA  
 Electrical Engineering  
 Phone: 562-985-8032  
 Email: [mahyar@csulb.edu](mailto:mahyar@csulb.edu)

**Areas of Expertise:**

1. Optimization
2. Military Policy & Wargaming
3. Transportation & Logistics



- ❖ Distributed Inventory Management Systems
- ❖ Mission Assurance Through Mitigating Cyber Vulnerabilities
- ❖ Modeling and Simulation
- ❖ Sense and Respond Logistics
- ❖ National Security



**Ömer S. Benli**

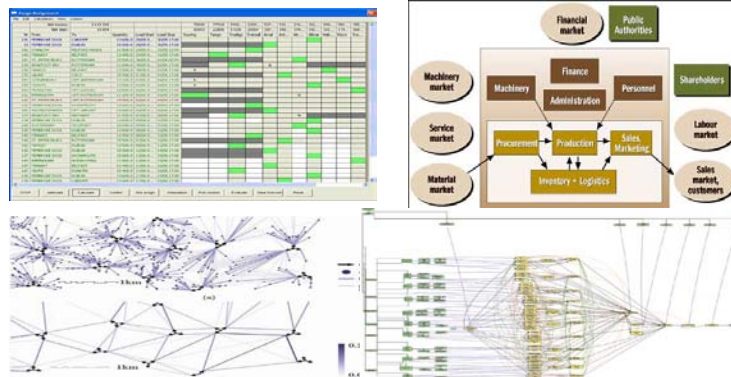
PhD: Syracuse University  
 College of Business  
 Administration  
 Phone: 562-985-7697  
 Email: [obenli@csulb.edu](mailto:obenli@csulb.edu)

**Areas of Expertise:**

1. Logic-based methods in optimization,
2. Analysis & design of supply chain & logistics systems,
3. Theory of machine scheduling.



- ❖ Event-Time Models for Supply Chain Scheduling
- ❖ Constraint Programming Approaches to Lot Streaming Problems of Machine Scheduling
- ❖ Consensus in Team Decision Making Involving Allocation of Resources
- ❖ Benchmarking the Efficacy of Team Decisions Using Game Theoretic Approaches,
- ❖ Optimization-Based Decision Support Systems for a University Timetabling Problems



**Eric Besnard**

PhD: Claremont Graduate University  
Mechanical and Aerospace Engineering  
Phone: 562-985-5442  
Email: [besnarde@csulb.edu](mailto:besnarde@csulb.edu)

**Areas of Expertise:**

1. Aerospace system design
2. Liquid rocket propulsion
3. Computational Fluid Dynamics (CFD)
4. Multidisciplinary Design Optimization (MDO)



- ❖ Flight Testing of Multi-chamber Aerospike Rocket Engine
- ❖ Ignition Characteristics of HAN-based Propellants
- ❖ Demonstration and Analysis of Reusable Launch Vehicles (RLV)
- ❖ Neural Networks in the Design Cycle; Applications to Ships and Yachts
- ❖ Access to Space



**Anastasios Chassiakos**

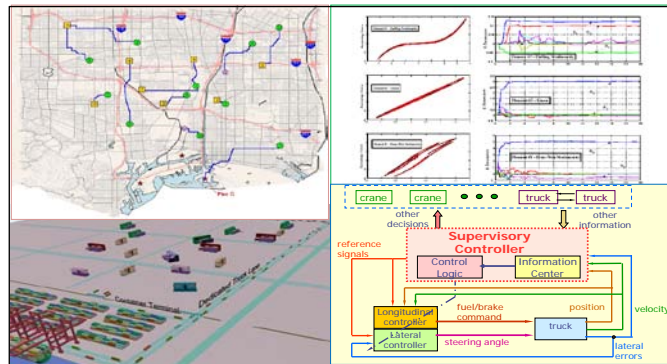
PhD: USC  
Electrical Engineering and Computer Engineering & Computer Science  
562-985-4278  
[achassk@csulb.edu](mailto:achassk@csulb.edu)

**Areas of Expertise:**

1. Nonlinear systems
2. Structural control
3. Intelligent transportation systems



- ❖ Reconfiguration Strategies for Mitigating the Impacts of Port Disruptions
- ❖ Modeling and Identification of Non-linear Structural Systems
- ❖ Terminal Simulation Test-bed and Design Tool
- ❖ Control of a Large Segmented Space Reflector
- ❖ Dynamic Optimization of Cargo Movement
- ❖ Structural Health Monitoring



**H. P. Chen**

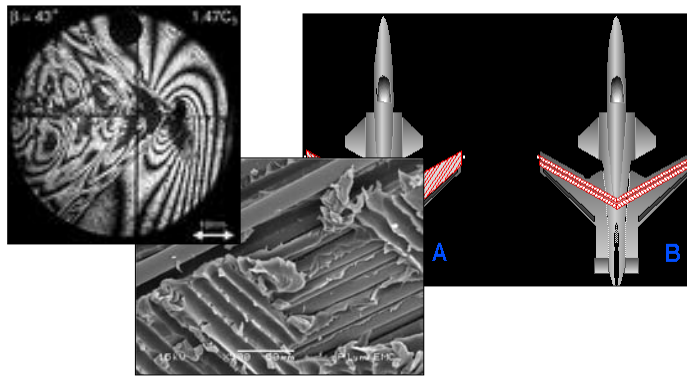
PhD: Georgia Institute of Technology  
Mechanical and Aerospace Engineering  
Phone: 562-985-1504  
Email: [hsinchen@csulb.edu](mailto:hsinchen@csulb.edu)

**Areas of Expertise:**

1. Composite structures
2. Finite element analysis
3. Structural design optimization



- ❖ Innovative Composite Aircraft Primary Structures
- ❖ Numerical Techniques of Dynamic Delamination Buckling and Growth in Laminated Structures
- ❖ Characterization and Detection of Delamination in Smart Composite Structures



**Christopher Druzgalski**

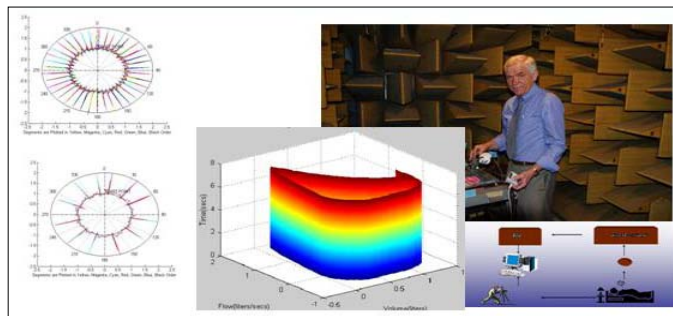
PhD: Ohio State University  
Electrical Engineering  
Phone: 562-985-8054  
Email: [druz@csulb.edu](mailto:druz@csulb.edu)

**Areas of Expertise:**

1. Biomedical/Clinical Engineering
2. Medical devices/systems
3. Telemedicine



- ❖ Healthcare delivery technologies and modalities
- ❖ Sensors and biosensors
- ❖ Acoustics and bioacoustics
- ❖ Signal processing
- ❖ Circuits/data acquisition systems



**Burkhard Englert**

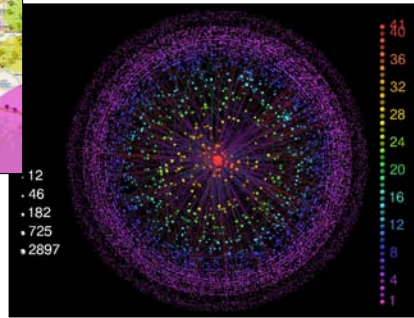
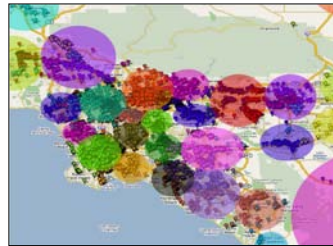
PhD: Univ. of Connecticut  
Computer Engineering and  
Computer Science  
Phone: 562-985-7987  
Email: [benglert@csulb.edu](mailto:benglert@csulb.edu)

**Areas of Expertise:**

1. Distributed Computing
2. Computer Security
3. Operations Research



- ❖ Distributed Systems and Algorithms
- ❖ Development, verification, analysis and implementation of fault tolerant distributed systems and algorithms
- ❖ Analysis of threats to and vulnerabilities of Computer Systems and Networks
- ❖ Optimization and Simulation of Transportation Networks and supply chains

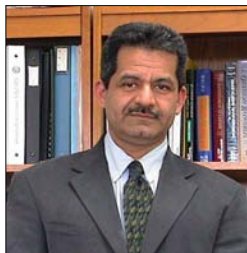


**Hamid Hefazi**

PhD: USC  
Mechanical and  
Aerospace Engineering  
Phone: 562-985-1502  
Email: [hefazi@csulb.edu](mailto:hefazi@csulb.edu)

**Areas of Expertise:**

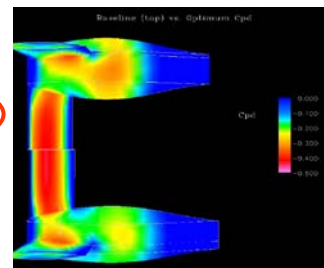
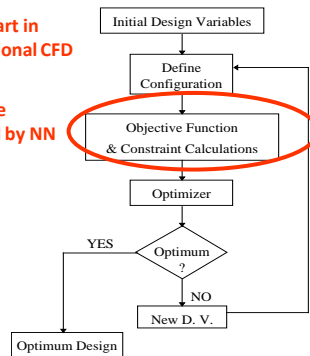
1. Computational Fluid Dynamics
2. Optimization
3. Aerodynamics



- ❖ Automated Hydrodynamic Shape Optimization Using Neural Networks
- ❖ Automated Multidisciplinary Design Optimization Method for Multi-Hull Vessels
- ❖ Neural Networks
- ❖ CFD
- ❖ MDO methods in Ship Design

• Costly part in conventional CFD opt.

• CFD code replaced by NN



**I-Hung Khoo**

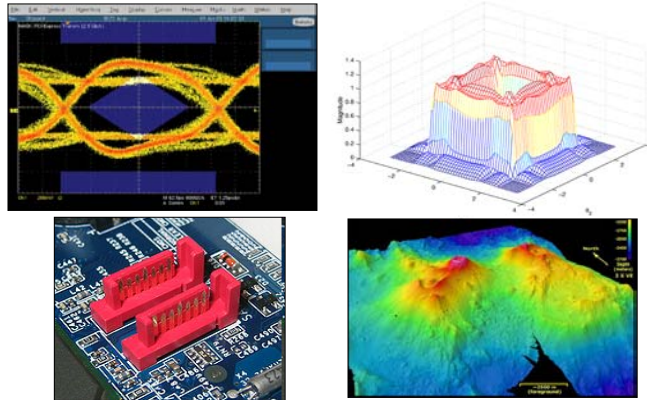
PhD: UCI  
Electrical Engineering  
Phone: 562-985-5082  
Email: [ikhoo@csulb.edu](mailto:ikhoo@csulb.edu)

**Areas of Expertise:**

- 1. Circuit Design
- 2. Digital Signal Processing
- 3. Communication Systems



- ❖ High Speed Communication Transceivers
- ❖ Two-dimensional Signal Processing
- ❖ Low Sensitivity Sampled-data and Digital Filters



**Rajendra Kumar**

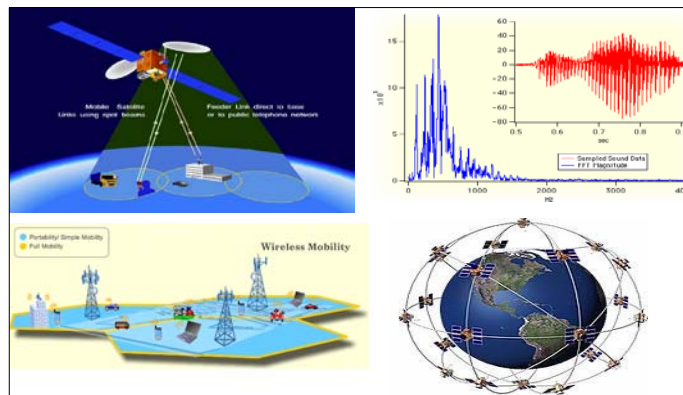
PhD: University of Newcastle  
Electrical Engineering  
Phone: 562-985-1556  
Email: [kumar@csulb.edu](mailto:kumar@csulb.edu)

**Areas of Expertise:**

- 1. Satellite Communication
- 2. Wireless Communication
- 3. GPS Systems
- 4. Adaptive Systems



- ❖ Mitigation of High Power Pulse Interference
- ❖ Modeling of CDMA System Capacity
- ❖ Adaptive Power Control Algorithms and Architectures
- ❖ Adaptive M-QAM Receivers for Fading Channels
- ❖ Modeling of Nonlinear Power Amplifiers for CDMA



**Shui Lam**

PhD: Penn State  
Computer Engineering  
and Computer Science  
Phone: 562-985-1552  
Email: [LAM@csulb.edu](mailto:LAM@csulb.edu)

**Areas of Expertise:**

1. Modeling & Simulation
2. Applied Scheduling
3. Parallel Computing



- ❖ Optimization of Shipment Scheduling
- ❖ Sequencing of Container Deliveries from Yard Stacks
- ❖ Process Modeling for Optimization and Simulation
- ❖ Decomposition for Parallel Computations
- ❖ Scheduling and Optimization



**Tulin Mangir**

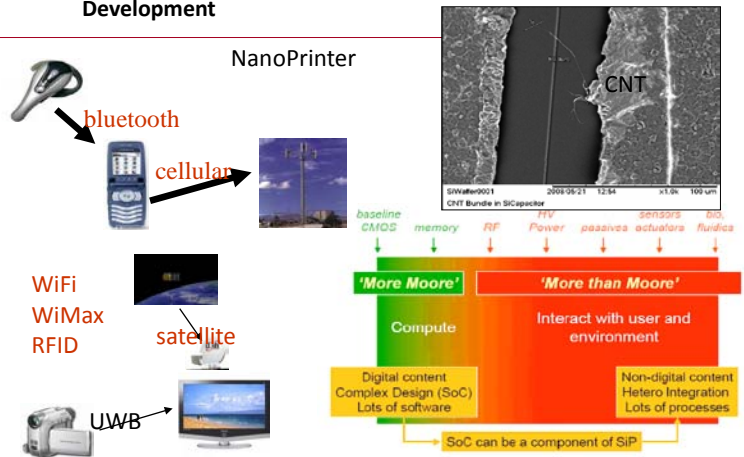
PhD: UCLA  
Electrical Engineering  
Phone: 562-985-5774  
Email: [temangir@csulb.edu](mailto:temangir@csulb.edu)

**Areas of Expertise:**

1. Systems Engineering
2. Mobile Communications
3. CyberSecurity/  
Infrastructure Security



- ❖ Integrity and Integration Issues for CNT Interconnect in Nano-Electronics; Nano-Bio Interface for Biotechnology Innovation
- ❖ Wireless and Mobile Networks, Security and Information Assurance
- ❖ Cyber Security/Infrastructure Security/Intelligent Transformation and Communication Security, SDR
- ❖ Systems Design and Modeling
- ❖ Green Entrepreneurship, Smart Grids, Sustainable Product Development



**Khosrow Moshirvaziri**

PhD: UCLA  
College of Business Administration  
Phone: 562-985-7965  
Email: moshir@csulb.edu

**Areas of Expertise:**

- 1. Mathematical Optimization
- 2. Systems Simulation
- 3. Transportation & Logistics
- 4. Statistical Analysis



- ❖ **Mathematical Modeling and Scheduling**
- ❖ **Large-Scale Engineering Project Management**
- ❖ **Discrete Event Simulation; Monte Carlo**
- ❖ **Transportation and Logistics**
- ❖ **Computational Algorithms**
- ❖ **Port and Airport Security Screening**



**Emelinda M. Parentela**

PhD: UNLV  
Civil Engineering and Construction  
Engineering Management  
Phone: (562) 985-4932  
Email: [parent@csulb.edu](mailto:parent@csulb.edu)

**Areas of Interests:**

- 1. Transportation Risk Assessment
- 2. Traffic/Transportation Modeling
- 3. Transportation Safety



- ❖ **Light-rail safety for pedestrians and drivers**
- ❖ **Effectiveness of LED crosswalk**
- ❖ **Traffic simulation**
- ❖ **Risk assessment along a major transportation corridor**



**Hamid R. Rahai**

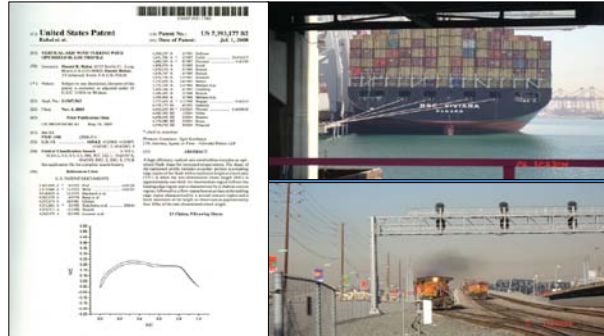
PhD: UCI  
Mechanical and  
Aerospace Engineering  
Phone: 562-985-5132  
Email: [rahai@csulb.edu](mailto:rahai@csulb.edu)

**Areas of Expertise:**

1. Air Pollution
2. Renewable Energy
3. Industrial Aerodynamics
4. Turbulence



- ❖ Diesel Emission Control, Emission Control Technology for Ocean Going Vessels
- ❖ Air Pollution Diffusion, Modeling, Industrial Aerodynamics
- ❖ Wind Energy within Urban Areas
- ❖ Turbulence and Mixing Processes

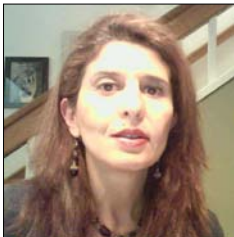


**Antonella Sciortino**

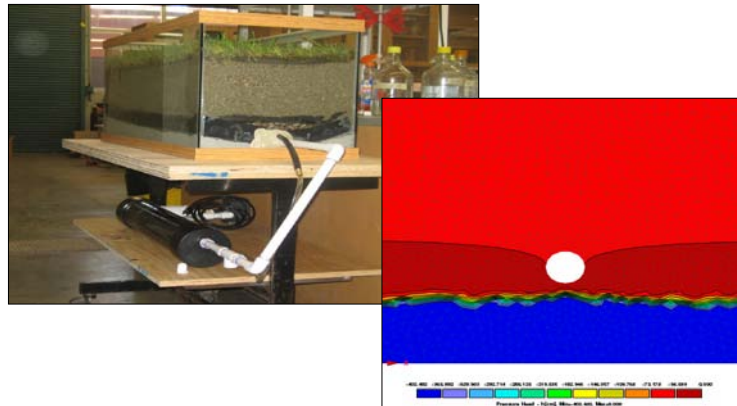
PhD: UCLA  
Civil Engineering and Construction  
Engineering Management  
Phone: 562-985-5119  
Email: [asciorti@csulb.edu](mailto:asciorti@csulb.edu)

**Areas of Expertise:**

1. Water Resources
2. Numerical Modeling
3. Optimization Methods for Water Resources Management



- ❖ Impact of reformulated fuels on soil and subsurface water quality
- ❖ Modeling of organic contaminants in groundwater
- ❖ Groundwater processes and modeling
- ❖ Vadose zone hydrology
- ❖ Design of efficient water recycling systems



**Tariq Shehab**

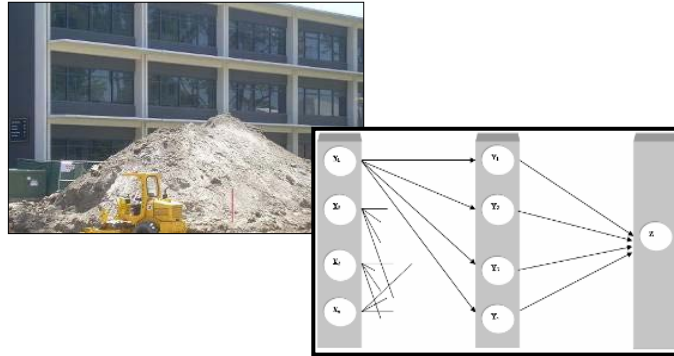
PhD: Concordia University  
Civil Engineering and Construction  
Engineering Management  
Phone: 562-985-1643  
Email: [shehab@csulb.edu](mailto:shehab@csulb.edu)

**Areas of Expertise:**

- 1. Automation in Construction
- 2. Infrastructure Management
- 3. Heavy Civil Construction
- 4. Cost Estimating



- ❖ Automated Measurement of Earthwork Volume
- ❖ AI-Based Budget Estimating Models for Utility Projects
- ❖ Automated Inspection
- ❖ No-Dig Technology
- ❖ Development of Automated Construction Systems



**Chit-Sang Tsang**

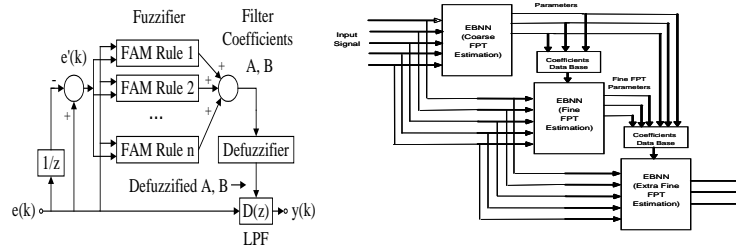
PhD: USC  
Electrical Engineering  
Phone: 562-985-1517  
Email: [ctsang@csulb.edu](mailto:ctsang@csulb.edu)

**Areas of Expertise:**

- 1. Communication
- 2. Digital Signal Processing



- ❖ Satellite communication system engineering
- ❖ Synchronization systems for digital communications
- ❖ Speech signal processing
- ❖ Applications of neural networks and fuzzy logics



**Henry Yeh**

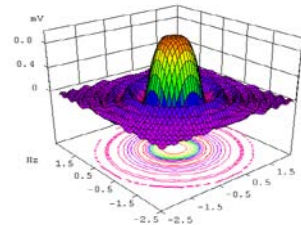
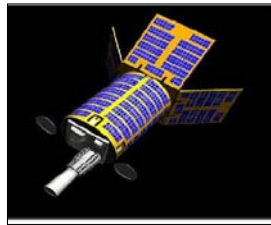
PhD: UCI  
Electrical Engineering  
Phone: 562-985-5102  
Email: [heyeh@csulb.edu](mailto:heyeh@csulb.edu)

**Areas of Expertise:**

1. Real-time DSP
2. Algorithm Development
3. Bit Exact Implementation



- ❖ IEEE 802.11/802.15/802.16
- ❖ Signal Detection and Timing Offset Estimation
- ❖ Frequency Offset Mitigation Techniques
- ❖ *M*-ary QAM/OFDM Transceiver in Mobile Fading Channels
- ❖ Low Complexity *M*-ary QAM Receiver – Hard and Soft Decision
- ❖ Bit Exact FIR/IIR Filter Implementation

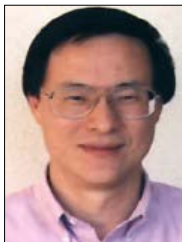


**Hsien-Yang Yeh**

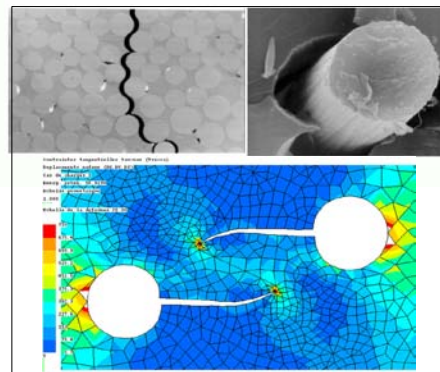
PhD: USC  
Mechanical and  
Aerospace Engineering  
Phone: 562-985-4611  
E Mail: [hyyeh@csulb.edu](mailto:hyyeh@csulb.edu)

**Areas of Expertise:**

1. Mechanics of Composite Materials
2. Fracture Mechanics
3. Structural Failure Analysis and Design



- ❖ Mechanics of Composite
- ❖ Failure Analysis and Fracture Mechanics Materials
- ❖ Structural Design



## Joint Doctoral Program: Student's Plan of Study Engineering and Industrial Applied Mathematics

Please list all the courses you are planning to take to satisfy the Joint Doctoral Program (JDP) course requirement. This plan requires the approval of your doctoral advisor and the Program Committee. This Plan of Study in consultation with your advisor and Program Committee may be altered at a subsequent time by petition.

Student's Name: \_\_\_\_\_

Today's Date: \_\_\_\_\_

Faculty Advisor: \_\_\_\_\_

Admission Date: \_\_\_\_\_

	<u>Engineering Courses</u>	<u>Units</u>		<u>Mathematics Courses</u>	<u>Units</u>
1.	_____	_____	1.	_____	_____
2.	_____	_____	2.	_____	_____
3.	_____	_____	3.	_____	_____
4.	_____	_____	4.	_____	_____
5.	_____	_____	5.	_____	_____
6.	_____	_____	6.	_____	_____
7.	_____	_____	7.	_____	_____
8.	_____	_____	8.	_____	_____
9.	_____	_____	9.	_____	_____
10.	_____	_____	10.	_____	_____

Student \_\_\_\_\_ Date \_\_\_\_\_

Faculty Advisor \_\_\_\_\_ Date \_\_\_\_\_

CSULB JDP Director \_\_\_\_\_ Date \_\_\_\_\_

CGU JDP Director \_\_\_\_\_ Date \_\_\_\_\_

**CGU/CSULB Joint Doctoral Program  
Engineering and Industrial Applied Mathematics**

**Preliminary Examination Permission Form**

This form must be submitted to CGU School of Mathematical Sciences (Susan Townzen) and a copy to the College of Engineering (Kim Truesdelle), before taking first preliminary examination.

NAME \_\_\_\_\_ CGU ID# \_\_\_\_\_  
(print)

Date Started in Program \_\_\_\_\_

Faculty Advisor \_\_\_\_\_  
(Print)

**Intended Areas of Preliminary Exams**

<b>Preliminary Exam Topics at CGU</b>	<b>Semester/Year</b>	<b>Based on Course(s)</b>
1. _____	_____	1. _____
		2. _____
2. _____	_____	1. _____
		2. _____

**Preliminary Exam Topics at CSULB**

		<b>Based on Course(s)</b>
1. _____	_____	1. _____
		2. _____
2. _____	_____	1. _____
		2. _____

Student \_\_\_\_\_ Date \_\_\_\_\_

Faculty Advisor \_\_\_\_\_ Date \_\_\_\_\_

CSULB JDP Director  
(for CSULB Exams) \_\_\_\_\_ Date \_\_\_\_\_

CGU JDP Director  
(for CGU Exams) \_\_\_\_\_ Date \_\_\_\_\_

**CGU/CSULB Joint Doctoral Program  
Engineering and Industrial Applied Mathematics**

**Transfer Credit Petition**

*Transfer credit must have been completed with at least a grade of B at an accredited graduate institution. It must be shown to be relevant to the degree program and to be of appropriate quality and currency. Courses graded Credit, Satisfactory, or Pass will not be considered for transfer without official verification from the institution of origin, noting that the CR/S/P is equivalent to a grade of B. Extension courses are not transferable without official verification from the institution of origin that the course(s) are graduate level and would be counted toward a graduate degree at that institution. Attach a copy of the official transcript in order to process this form.*

NAME \_\_\_\_\_ CGU ID# \_\_\_\_\_  
(print)

Faculty Advisor \_\_\_\_\_  
(Print)

	<u>Course Title and Number</u>	<u>Units</u>	<u>University</u>	<u>Grade</u>	<u>Date Taken</u>	<u>Approved</u>
1.	_____	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____	_____
5.	_____	_____	_____	_____	_____	_____
6.	_____	_____	_____	_____	_____	_____
7.	_____	_____	_____	_____	_____	_____
8.	_____	_____	_____	_____	_____	_____
9.	_____	_____	_____	_____	_____	_____

CSULB JDP Director \_\_\_\_\_ Date \_\_\_\_\_

CGU JDP Director \_\_\_\_\_ Date \_\_\_\_\_

Registrar \_\_\_\_\_ Date \_\_\_\_\_

Data Control \_\_\_\_\_ Date \_\_\_\_\_

This set of forms has been improved; please review these Guidelines carefully and follow instructions.

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*FORM 1 - Ph.D. Qualifying Exam Results*

**Form 1** *Qualifying Exam Results* may be filed in the Office of Admission & Records with the Assistant Registrar **after** the student has completed the program of study. Refer to the CGU Bulletin and academic department handbook for prerequisite checklists and requirements for the composition of the student's Qualifying Exam Committee.

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*FORM 2A - Ph.D. Advancement to Candidacy: Committee Proposal*

**Form 2A** *Committee Proposal* may be filed in the Office of Admission & Records with the Assistant Registrar after **Form 1: Qualifying Exam Results** has been completed and submitted. Advancement to Candidacy is not complete until both Form 2A and 2B are completed and submitted.

*FORM 2B - Ph.D. Advancement to Candidacy: Dissertation Proposal*

**Form 2B** *Dissertation Proposal* may be filed in the Office of Admission and Records with the Assistant Registrar after **Form 2A: Committee** has been approved and submitted. Advancement to Candidacy is not complete until both Form 2A and 2B are completed and submitted.

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*FORM 3A - Final Oral Examination: Committee Proposal*

**Form 3A** *Committee Proposal* may be filed in the Office of Admission & Records with the Assistant Registrar after **Forms 2A& B, Advancement to Candidacy** have been completed and submitted. The Oral Exam Committee **must be approved (Form 3A)** no later than 3 weeks before your Final Oral Exam Date. The date of the Final Oral Exam (dissertation defense) **may not occur sooner than 6 months** after you have been advanced to candidacy.

*FORM 3B - Final Oral Examination Results*

**Form 3B** *Final Oral Examination Results* may be filed in the Office of Admission and Records with the Assistant Registrar after **Form 3A** has been approved. Procedures for retaking an unsuccessful examination are outlined in the CGU Bulletin.

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Please refer to the academic calendar online at [www.cgu.edu/calendar](http://www.cgu.edu/calendar) for degree-completion deadlines in the semester in which you plan to graduate.

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**Form 1** may be filed in the Office of Admission & Records with the Assistant Registrar **after** the student has completed the program of study. Refer to the CGU Bulletin and academic department handbook for prerequisite checklists and requirements for the composition of the student's Qualifying Exam Committee.

**Instructions:**

- Complete Student Information and Prerequisite Checklist.
- Print the names of the Qualifying Exam Committee members in the left-hand column below.
- Following evaluation of the student's Qualifying Exam, the committee members will indicate the results and sign in the right-hand column.

**STUDENT INFORMATION**

**Last Name:** \_\_\_\_\_ **First Name:** \_\_\_\_\_

**CGU ID #254-** \_\_\_\_\_ **Dept:** \_\_\_\_\_ **Degree:** \_\_\_\_\_

**PREREQUISITE CHECKLIST FOR QUALIFYING EXAMINATIONS**

- |   |                            |
|---|----------------------------|
| _____ Full Graduate Standing                        | _____ First Research Tool  |
| _____ 48 Units Completed (including transfer units) | _____ Second Research Tool |
| _____ Current Registration (current semester)       |                            |

Date(s) of previous attempt(s) if any: \_\_\_\_\_

Comments: \_\_\_\_\_

**QUALIFYING EXAM COMMITTEE** (number of members vary by department)

**Print committee member names and university affiliation below.**

**Committee Members sign & date below.**

1.	_____	_____	_____
	Print committee chair name	Institution / field	Signature / Date
2.	_____	_____	_____
	Print member name	Institution / field	Signature / Date
3.	_____	_____	_____
	Print member name	Institution / field	Signature / Date
4.	_____	_____	_____
	Print member name	Institution / field	Signature / Date
5.	_____	_____	_____
	Print member name	Institution / field	Signature / Date

**RESULT OF QUALIFYING EXAMINATIONS VERIFIED BY COMMITTEE CHAIR AND MEMBERS**

1. ( ) Examinations passed on \_\_\_\_\_ (date)
2. ( ) Examinations failed on \_\_\_\_\_ (date)
  - a. ( ) Student is granted another attempt to pass.
  - b. ( ) Student is withdrawn from doctoral program and may be considered for a terminal Master's degree.
  - c. ( ) Student is terminated and not permitted to register as of \_\_\_\_\_ (semester and year).

**For Internal Use:**

Verified by (Registrar): \_\_\_\_\_ Copy to Department : \_\_\_\_\_ Processed by (Data Services): \_\_\_\_\_

The **purpose** of this set of forms is to obtain approval for Advancement to Candidacy. Form 2A is for committee approval and Form 2B is for dissertation proposal approval.

**Office of Admission and Records**  
160 East Tenth Street, Claremont, CA 91711 • Ph. (909) 621-8285 • Fax (909) 607-7285 • student.records@cgu.edu

**Form 2A Committee Proposal** may be filed in the Office of Admission & Records with the Assistant Registrar after **Form 1: Qualifying Exam Results** has been completed and submitted. Advancement to Candidacy is not complete until both Form 2A and 2B are completed and submitted.

**Instructions:**

- Complete student information.
- Print the names of the committee members who will approve the dissertation proposal. The committee must consist of at least three members; follow the guidelines listed below.
- Obtain approval of the Dissertation Chair and the Dean of the School for the proposed committee.
- Submit approved form to the Office of Admission & Records (Assistant Registrar).

STUDENT INFORMATION

Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_

CGU ID #254 - \_\_\_\_\_ Dept: \_\_\_\_\_ Degree: \_\_\_\_\_

Current Registration \_\_\_\_\_ Semester / year      Qualifying examinations passed on \_\_\_\_\_ Date

PROPOSED DISSERTATION COMMITTEE

**3-person committee:**

Two of the three members must be CGU core faculty in the candidate's field (program) and one may be an outside examiner. The outside examiner may be either a CGU core faculty member in another field (program) or a member of the graduate faculty from any of the other Claremont Colleges. See the CGU [Bulletin](#) for a list of core faculty and Claremont Colleges Faculty.

**4-person committee:**

Same requirements as the 3-person committee and the fourth may be a faculty member from any of the other Claremont Colleges or another accredited institution outside of the Claremont Colleges, or a qualified institution practitioner.

1.	_____	<b>CGU /</b>
	Print <b>committee chair</b> name	CGU field or program
2.	_____	<b>CGU /</b>
	Print <b>member</b> name	CGU field or program
3.	_____	_____
	Print <b>member</b> name	Institution / field
4.	_____	_____
	Print 4th <b>member</b> , (optional for some schools) name	Institution / field

APPROVAL OF DISSERTATION COMMITTEE

Recommended by \_\_\_\_\_ Chair, Dissertation Committee      \_\_\_\_\_ Date

Approved by \_\_\_\_\_ The Dean of the School      \_\_\_\_\_ Date

**For Internal Use:** Verified by (Registrar): \_\_\_\_\_ Copy to Department: \_\_\_\_\_

The **purpose** of this set of forms is to obtain approval for Advancement to Candidacy. Form 2A is for committee approval and Form 2B is for dissertation proposal approval.

**Office of Admission and Records**  
160 East Tenth Street, Claremont, CA 91711 • Ph. (909) 621-8285 • Fax (909) 607-7285 • student.records@cgu.edu

**Form 2B Dissertation Proposal** may be filed in the Office of Admission and Records with the Assistant Registrar after **Form 2A: Committee** has been approved and submitted. Advancement to Candidacy is not complete until both Form 2A and 2B are completed and submitted.

**Instructions:**

- Complete student information.
- Print the names of the approved committee members from Form 2A in the left-hand column below.
- Following evaluation of the student's Dissertation Proposal, the committee members will indicate their results and sign in the right-hand column.
- Once completed, submit this form to the Office of Admission and Records (Assistant Registrar).

**STUDENT INFORMATION**

Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_

CGU ID #254 - \_\_\_\_\_ Dept: \_\_\_\_\_ Degree: \_\_\_\_\_

Current Registration \_\_\_\_\_ Semester / Year      Qualifying examinations passed on \_\_\_\_\_ Date

**Attach a 350-word summary of the Dissertation Proposal; list title below.**

Title of Proposed Dissertation \_\_\_\_\_  
\_\_\_\_\_

**DISSERTATION COMMITTEE (from Form 2A)**

**Print approved committee member names and university affiliation below.**

**Committee member's approval signature & date**

	<b>CGU /</b>	
1. _____ Print committee chair name	CGU field or program	_____ Signature / date
2. _____ Print member name	<b>CGU /</b> CGU field or program	_____ Signature / date
3. _____ Print member name	Institution / field	_____ Signature / date
4. _____ Print 4th member name <i>(optional for some schools)</i>	Institution / field	_____ Signature / date

**ADVANCMENT TO CANDIDACY**

**The committee above accepts this proposal and the student is recommended and approved for advancement to candidacy.**

Recommended by \_\_\_\_\_ Chair, Dissertation Committee      \_\_\_\_\_ Date

Approved by \_\_\_\_\_ The Dean of the School      \_\_\_\_\_ Date

**For Internal Use:**    Verified by (Registrar): \_\_\_\_\_    Copy to Department: \_\_\_\_\_    Processed by (Data Services): \_\_\_\_\_



Final Oral Examination (Dissertation Defense): Committee Proposal
The purpose of this set of forms is to obtain approval of Oral Examination Committee from the Dean of the School (Form 3A) and to document the results of the student's Oral Exam by the approved committee (Form 3B).

Office of Admission and Records
160 East Tenth Street, Claremont, CA 91711 • Ph. (909) 621-8285 • Fax (909) 607-7285 • student.records@cgu.edu

Form 3A Committee Proposal may be filed in the Office of Admission & Records with the Assistant Registrar after Forms 2A & B, Advancement to Candidacy have been completed and submitted. The Oral Exam Committee must be approved (Form 3A) no later than 3 weeks before your Final Oral Exam Date. The date of the Final Oral Exam (dissertation defense) may not occur sooner than 6 months after you have been advanced to candidacy.

Instructions:

- Complete student information.
Print the names of the committee members who will administer the final oral exam (dissertation defense). The committee must consist of at least three members; follow the guidelines listed below.
Obtain approval of the Dissertation Chair and the Dean of School for the proposed committee
Submit approved form to the Office of Admission & Records (Assistant Registrar).
Note: following approval, the Dean of the School must approve any changes in the makeup of the committee.

STUDENT INFORMATION

Last Name: First Name:

CGU ID #254 - Dept: Degree:

Current Registration Semester / year Advanced to Candidacy Date

The Final Oral Examination is scheduled to occur (at least 6 months after Advancement to Candidacy).

Date Time Location

PROPOSED ORAL EXAM COMMITTEE

3-person committee:

Two of the three members must be CGU core faculty in the candidate's field (program) and one may be an outside examiner. The outside examiner may be either a CGU core faculty member in another field (program) or a member of the graduate faculty from any of the other Claremont Colleges. See the CGU Bulletin for a list of core faculty and Claremont Colleges Faculty.

4-person committee:

Same requirements as the 3-person committee and the fourth may be a faculty member from any of the other Claremont Colleges or another accredited institution outside of the Claremont Colleges, or a qualified institution practitioner.

- 1. CGU / CGU field or program
2. CGU / CGU field or program
3. Institution / field
4. Institution / field

APPROVAL OF FINAL ORAL EXAM COMMITTEE

Recommended by Chair, Oral Examination Committee Date

Approved by The Dean of the School Date

For Internal Use: Verified by (Student Records): Original to student file: Copy to Department :

The **purpose** of this set of forms is to obtain approval of the doctoral student's Oral Examination Committee from the Dean of the School (Form 3A) and to document the results of the student's Oral Exam by the approved committee (Form 3B).

Office of Admission and Records

160 East Tenth Street, Claremont, CA 91711 • Ph. (909) 621-8285 • Fax (909) 607-7285 • student.records@cgu.edu

**Form 3B Final Oral Examination Results** may be filed in the Office of Admission and Records with the Assistant Registrar after **Form 3A** has been approved. Procedures for retaking an unsuccessful examination are outlined in the CGU Bulletin.

**Instructions:**

- Complete student and oral examination information.
- **The final oral exam cannot be held sooner than six months after advancement to candidacy.**
- Print the names of the approved committee members from *Form 3A* in the left-hand column below.
- Submit completed form to the Office of Admission and Records (Assistant Registrar).

STUDENT INFORMATION

Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_

CGU ID #254 - \_\_\_\_\_ Dept: \_\_\_\_\_ Degree: \_\_\_\_\_

Current Registration \_\_\_\_\_ Semester / year      Advanced to Candidacy on \_\_\_\_\_ Date

APPROVED ORAL EXAM COMMITTEE (*from Form 2A*)

Print committee member names and university affiliation below.

Committee members sign & date below.

1. _____ Print committee chair name	<b>CGU /</b> CGU / field	_____ Signature / Date
2. _____ Print member name	<b>CGU /</b> CGU / field	_____ Signature / Date
3. _____ Print member name	Institution/ field	_____ Signature / Date
4. _____ Print 4th member name <i>(optional for some schools)</i>	Institution/ field	_____ Signature / Date

APPROVAL OF FINAL ORAL EXAM

**As the committee authorized to conduct the examination, we certify the results of this Final Oral Examination held on \_\_\_\_\_ (date). The student ( ) is ( ) is NOT recommended for the degree upon submission of the signed dissertation to the Office of Admission and Records.**

Recommended by \_\_\_\_\_ Chair, Oral Examination Committee      \_\_\_\_\_ Date

Approved by \_\_\_\_\_ The Dean of the School      \_\_\_\_\_ Date

**For Internal Use:** Verified by (Registrar): \_\_\_\_\_ Original to student file: \_\_\_\_\_ Copy to Department: \_\_\_\_\_ Processed by (Data Services): \_\_\_\_\_