Texas Higher Education Coordinating Board
Texas Public Universities and Health-Related Institutions

Proposal for a New Doctoral Program

Directions: Texas public universities and health-related institutions complete this form to propose a new doctoral degree program. This form requires signatures of (1) the Chief Executive Officer, certifying adequacy of funding for the new program; (2) the Chief Executive Officer, acknowledging agreement to reimburse expert external reviewers' costs; (3) the Chief Financial Officer, certifying the accuracy of funding estimates for the new program; (4) a member of the Board of Regents (or designee), certifying Board of Regents approval for Coordinating Board consideration; or, if applicable, (5) a member of the Board of Regents (or designee), certifying that criteria have been met for Commissioner consideration. Institution officials should also refer to Texas Administrative Code (TAC), Title 19, Chapter 5, Subchapter C, Section 5.46, *Criteria for New Doctoral Programs.*

Note: An institution must submit Planning Notification prior to submitting a proposal for a new doctoral program. An institution is considered by the Board to be planning for a new doctoral program if it takes any action that leads to the preparation of a proposal for a new program. This includes hiring personnel, including consultants and planning deans, leasing and/or purchasing real estate, building facilities, and/or developing curriculum. Planning Notification must be submitted at least one year prior to submission of a proposal to offer the degree, if the proposed program leads to the award of a professional degree, as defined by Texas Education Code 61.306. Institutions submit Planning Notification through the online submission portal, as a letter to the Assistant Commissioner of the Academic Division of Academic Quality and Workforce.

Contact: Division of Academic Quality and Workforce, 512-427-6200.

Administrative Information

1. Institution Name and Coordinating Board Accountability Group:

University of Texas at San Antonio, Emerging Research

2. Proposed Program:

Doctor of Philosophy in Computer Engineering

3. Proposed CIP Code: 14.0901

4. Location and Delivery of the Proposed Program:

The proposed program will be delivered by the Department of Electrical and Computer Engineering within the College of Engineering and Integrated Design at UTSA.

Instructed on the UTSA 1604 Campus in San Antonio, face-to-face.

5. Administrative Unit:

The proposed program will be administered by the Department of Electrical and Computer Engineering within the College of Engineering.

6. Program Description:

This proposal is to offer a new *Ph.D. program in Computer Engineering*.

The Department of Electrical and Computer Engineering (ECE) at UTSA currently offers the following degrees programs

- B.S. in Electrical Engineering
- B.S. in Computer Engineering
- M.S. in Electrical Engineering
- M.S. in Computer Engineering
- Ph.D. in Electrical Engineering

Both the B. S. (Electrical Engineering) and B. S. (Computer Engineering) programs are separately ABET accredited.

Students entering the Ph.D. in Electrical Engineering program can choose from five different concentration areas given below:

- Communications
- Computer Engineering
- Digital Signal Processing (DSP)
- Electronic Materials and Devices
- Systems and Control and Electric Power Engineering

Computer Engineering is the largest among these concentrations and more than one third of the students (40 out of 104 total students as of Fall 2020) in Ph.D. in Electrical Engineering choose Computer Engineering as their concentration area. *This proposal is to offer a new Ph.D. program in Computer Engineering for the students who are currently enrolled in the Ph.D. program in Electrical Engineering with Computer Engineering concentration.* The requirements for the proposed program are similar to the current Ph.D. program in Electrical Engineering with Computer Engineering concentration.

A separate Computer Engineering degree provides students the freedom to enhance their knowledge in the broad range of topics comprising computer engineering; such as Computer Architecture, High Performance Computing, Embedded Systems, VLSI and System on Chip, Cyber Security, Hardware Security, Artificial Intelligence and Machine Learning, Mobile, Distributed and Cloud Computing, Advanced Digital System and Hardware Design, and Software Systems. This flexibility in focused research in computer engineering is expected to attract additional students to the program who otherwise would not have chosen UTSA.

The proposed degree will require 81 semester credit hours beyond the bachelor's degree or 54 semester credit hours beyond the master's degree. It also requires passing a qualifying examination, passing a dissertation proposal defense/examination, passing a final oral

dissertation defense, and acceptance of the Ph.D. dissertation. A two-semester residency research period is also required.

7. Proposed Implementation Date:

Spring 2023

8. Institutional and Department Contacts:

Provide contact information for the person(s) responsible for addressing any questions related to the proposal.

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Proposed Doctoral Program Information

I. Need

A. Job Market Need

There has been a growing demand for PhD graduates in the field of Computer Engineering both in Texas and in the nation. In Texas, there have been 1,053 job openings over the twelve-month period during 2019-2020 as per Burning Glass Technologies' Labor Insight. Texas is only second to California in the top hiring regions in the nation. Top Texas hirers of PhD in Computer Engineering graduates include organizations such as Advanced Micro Devices, Southwest Research Institute and Raytheon. Furthermore, the San Antonio/New Braunfels region has "Much higher demand than average" with 164 job openings during 2019-2020. Nationwide, there has been a demand of over 13,000 jobs during 2019-2020. The heat map in Figure 1 shows the nationwide demand. (The darker the shade, the higher the demand.)

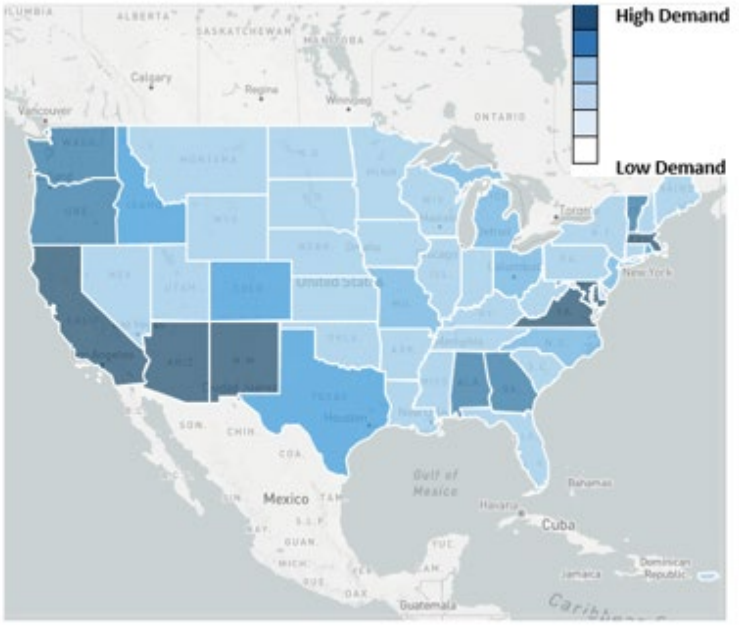

Figure 1*: Heat map of Nationwide Demand for PhD in Computer Engineering Graduates (Source: Labor Insight-(Burning Glass Technologies))*

Table 1: *Demand Vs Supply for PhD in Computer Engineering Graduates (Source: Burning Glass Technologies and National Center for Education Statistics)*

	Job Demand (2019-2020)	PhD in Computer Engineering Degrees Conferred (2018)
Texas	1053	35
Nation	13,313	388
San Antonio/New Braunfels	164	0

As illustrated in Table 1, there is a major shortage of PhD graduates in Computer Engineering in the San Antonio region, the State of Texas and the nation. Recent data on job demand vs

degrees conferred shown in table above underlines the shortage of PhD graduates in the Computer Engineering field. For instance, the San Antonio area had 164 job openings in 2019-2020. However, the supply of PhD graduates in Computer Engineering from this geographic area from the previous year (2018) was zero. While UTSA offers a PhD in Electrical Engineering degree with a concentration in Computer Engineering, it puts our graduates at a major disadvantage in the job market – the numbers cited in Table 1 are targeted specifically toward graduates with a "PhD in Computer Engineering" degree.

Job market demand for Computer Engineering PhD graduates is strong both in the industry and in academia. Leading technology companies such as Apple Inc., IBM, Microsoft, Intel Corporation, Google, Amazon, Texas Instruments, Nvidia, Broadcom etc. all need Computer Engineering PhD graduates. The recent boom in artificial intelligence is partly due to the innovations in computer hardware and computer engineers are expected to play a key role in the evolution of this important area. PhD students in Electrical Engineering at UTSA who graduated with the computer engineering concentration have been very successful in obtaining positions both in the industry and in academia. Our students have been hired by leading technology companies such as Apple Inc., AMD, ARM corporation etc. Also, our students have been hired as tenure track assistant professors in universities such as Rochester Institute of Technology and California State University. A partial list of students who graduated with a PhD in Electrical Engineering with a concentration in Computer Engineering and their first employment is given in the table below.

Table 2: *List of students who graduated with a PhD in Electrical Engineering with a concentration in Computer Engineering and their First Employment*

Name	Degree Earned	First Employment
Dhireesha Kudithipudi	Summer 2006	Assistant Professor Rochester Institute of Technology
Hsiu-Jy Ho	Spring 2007	Test Engineer, Aviat Networks, Austin, TX
Chirag Parikh	Summer 2007	Assistant Professor Grand Valley State University
Ashok Tummala	Fall 2007	Engineer, ARM
Christopher Martinez	Spring 2008	Assistant Professor University of New Haven
Pradeep Nair	Summer 2009	Assistant Professor California State University - Fullerton
Savitra Eratne	Summer 2012	Director Alamo College, San Antonio
Yilin Zhang	Fall 2014	MTS Engineer, AMD
Lu Wang	Fall 2015	Software Engineer, Synopsys Inc. Sunnyvale, CA
Milad Maleki	Spring 2016	N/A
Safwat Mostafa	Summer 2016	Senior Engineer, Apple Inc, Austin, Texas
Santosh Venkataswamy	Summer 2017	Senior Engineer, Global Foundries, Santa Clara, CA.
Jiwan Ninglekhu	Fall 2017	Senior Research and Innovation Engineer InterDigital, Inc.
Wenjun Wang	Spring 2018	MTS Performance Engineer, NetApp
Juan Portillo	Summer 2018	Assistant Professor California State University - Fullerton
Hao Yan	Spring 2019	Senior Engineer, Samsung, Austin, TX
Debnath Monobrata	Fall 2016	Qualcomm
Mandrita Banerjee	Summer 2020	Visiting assistant teaching professor, University of Southern Mississippi
Samir Talegaon	Fall 2020	Postdoc, Rutgers University
Sherifdeen Lawal	Fall 2021	Postdoc, NIST (Pending)
Armin Haj Aboutalebi	Fall 2019	Senior Research Engineer, Samsung, San Jose, CA
Shane Carroll	Summer 2021	Software Engineer, Sierra Nevada Corp.
Nihar Shrikant Bendre	Summer 2021	Intel
Amin Sahba	Summer 2021	Visiting Assistant Prof, Sam Houston State University
Gonzalo De La Torre	Summer 2021	Assistant Professor, University of the Incarnate Word
Samuel Silva	Summer 2021	Computer Vision Engineer, Blackmagic Design
Ramin Sahba	Summer 2021	Visiting Assistant Prof, Sam Houston State University
Nima Ebadi	Fall 2021	Engineer, Murano Corp
Arun Das	Fall 2021	Post Doc, Pittsburgh Medical School

B. Existing Programs

The need for more Texas-educated Computer Engineering (CE) PhD graduates is further illustrated by examining the current output of the five Texas universities that have CE PhD programs. The data presented in the table below reflect all five doctoral programs in CE in Texas. These data suggest adequate student interest and demand to support an additional doctoral program in the state, especially in an urban and diverse city such as San Antonio. As mentioned earlier this is a proposal to offer a new PhD program in Computer Engineering for the students who are currently enrolled in the PhD program in Electrical Engineering with Computer Engineering concentration.

Not only will the proposed CE PhD program help fill the gap of CE PhD graduates needed in the state, but it will also produce highly trained, technical professionals in emerging areas of computer engineering such as such as Hardware Security, Artificial Intelligence and Machine Learning, Mobile, Distributed and Cloud Computing and Cyber Security. In addition, the College of Engineering and Integrated Design (CEID) at UTSA has strong collaborations with the Alvarez College of Business through the interdisciplinary Center for Innovation and Technology Entrepreneurship. This collaboration creates a pipeline for UTSA faculty and students to develop new technology ventures and gain knowledge business skills.

Table 3: *Existing CE Programs at Texas universities*

Institution	CIP Code	Degree Program	2016 Enrolled/ Graduated		2017 Enrolled/ Graduated		2018 Enrolled/ Graduated		2019 Enrolled/ Graduated		2020 Enrolled/ Graduated	
Texas A & M University	14.0901	PhD Computer Engineering	61	9	68	8	71	9	67	9	69	12
Southern Methodist University	14.0901	PhD Computer Engineering	8	0	8	1	7	3	5	0	6	0
UT - Dallas	14.0901	PhD Computer Engineering	12	1	19	1	20	2	27	3	36	3
UT - Arlington	11.0701	PhD Computer Engineering		16					10	5	16	
UT – El Paso	14.4701	PhD Computer Engineering	39	7	34	5	29	2	31	4	23	

C. Student Demand

UTSA's PhD program in Electrical Engineering had 94 students enrolled as of Fall 2021, out of which 40 are in the Computer Engineering concentration. All the students who are currently in the PhD program in EE with a computer engineering concentration will be admitted to the proposed PhD program in Computer Engineering. The enrollment of students in this concentration has been growing for the last few years. Table 4 below gives the growth of students in PhD in Electrical Engineering with Computer Engineering concentration.

There is also a national trend in offering a separate PhD in Computer Engineering. To name a few, universities such as Pennsylvania State University, George Washington University, Boston University, UT Arlington, Southern Methodist University (SMU), Colorado State University, University of Nebraska – Lincoln, University of Virginia, University of California – Irvine, Steven's Institute of Technology, University of Massachusetts – Lowell, University of Maryland Baltimore County, University of Louisiana at Lafayette, UT Dallas, etc. currently offer a separate PhD program in Computer Engineering.

Table 4: *Student enrollment in PhD in Electrical Engineering with Computer Engineering Concentration*

Academic Year	2017-18	2018-19	2019-20	2020-2021
Number of Students	27	35	41	44

The ECE department at UTSA currently offers two different ABET accredited bachelor's degrees: (1) BS in Electrical Engineering and (2) BS in Computer Engineering. The ECE department currently also offers two separate Master's degrees: (1) MS in Electrical Engineering and (2) MS in Computer Engineering. By creating an exclusive PhD program in Computer Engineering, the students who graduate from the BS/MS degrees in Computer Engineering will have the option to pursue a focused and advanced program to further their technical knowledge in this niche field that is highly sought in the tech industry and academia today.

D. Student Recruitment

UTSA has been in the forefront of training Hispanic minority students at both the undergraduate and graduate levels. We will continue to use the current recruitment policy and strategy of the ECE department which has been very successful in recent years. For recruitment we will also use UTSA's new institutional strategy using Salesforce CRM, managed by the Graduate School. UTSA is a Hispanic Serving Institution, committed to diversity and inclusion. UTSA continues to be a leader in educating diverse student populations at the undergraduate and graduate levels. Currently, UTSA's overall student population is 64% underrepresented minorities, 45% first generation college students, and 14% military affiliated students. The percentage of underrepresented minorities in UTSA's master's and doctoral graduates is 54% and 29%, respectively. UTSA's CEID is committed to recruiting and retaining highly qualified graduate students of diverse backgrounds. To that end we will actively recruit students from Hispanic Severing Institutions in South Texas such as University of Texas-Rio Grande Valley and Texas A&M Kingsville.

At present no doctoral program in Computer Engineering exists in South Texas. The proposed program at The University of Texas at San Antonio provides a unique opportunity for doctoral studies in computer engineering for people in the South Texas region and across the State of Texas.

We will have an active recruitment program to reach our enrollment projections, including underrepresented minority (URM) students. One of the main goals of the recruitment plan is

to reach out to qualified minority students that do not have opportunities to further their engineering education due to financial constraints. Given the relative proximity to San Antonio, recruitment efforts will focus on reaching out to undergraduate and graduate institutions offering degrees in Electrical and Computer Engineering in the metropolitan areas of San Antonio, Houston, and Dallas-Fort Worth, which encompass a large percentage of the total population of the state. In addition to those areas, recruitment efforts will extend to other higher education institutions in the state of Texas with large minority populations such as El Paso. The recruitment plan will specifically target the following constituencies:

UTSA Computer Engineering Master's graduates: UTSA has a large minority undergraduate population, and many of our undergraduate students are first-generation college graduates who need financial aid to remain in graduate school. This will be the primary target group of the recruitment plan because these students are already acclimated to the city of San Antonio and UTSA, and in need of opportunities to pursue graduate degrees in engineering. While some of them are served by other institutions in the state, there are a large number of them who find it difficult to relocate for a number of different reasons. By actively recruiting our UTSA master students, our goal is to retain 20 - 25% of our master's students into the doctoral program

Part-time Students: The department of Electrical and Computer Engineering has connections with high tech firms in Austin and San Antonio and the Southwest Research Institute engineering staff and the US Air force. Many engineers from these institutions may be interested in doctoral studies. UTSA offers an excellent environment for these part time students because many of the ECE graduate courses are offered after business hours, which allows practicing engineers to satisfy a large part of Doctoral course requirements while being full-time employees. We will advertise the program to our partners through emails, print material, and on-campus info meetings. The course offerings will be structured so that the part-time students can continue to make timely progress towards graduation, which is a key consideration for this particular constituency.

Students from other Texas Universities without Doctoral programs in Computer Engineering: In order to achieve our recruitment goals for underrepresented and total students, we will have to reach out to students that do not currently have adequate opportunities to pursue PhD degrees in Computer Engineering. As part of this effort, we will reach out to other Texas universities that do not have any graduate degrees or only offer a master's graduate degree in computer engineering. Examples of these institutions are UT-Tyler, Texas A&M- Kingsville, St. Mary's University and UT-Rio Grande Valley.

Students Outside of Texas: Nationally, we will contact other computer engineering graduate programs, REU and LSAMP programs and specifically target minority serving institutions to distribute information to students about the proposed PhD in computer engineering. We will contact chapters of student engineering organizations such as the Mexican American Engineering Students, Society of Hispanic Professional Engineers, IEEE (Institute of Electrical and Electronic Engineers) student chapters, and Society of Women Engineers across the country. Although this effort will not be exclusive to underrepresented groups, our expectation is that we will increase the number of applicants and include targeting of minority serving institutions.

International Students: We will target graduates from universities in Mexico, Central and South America. We will work with the UTSA International Officer to continue to set-up partnerships with other international institutions to recruit qualified students from Latin America and beyond.

E. Enrollment Projections

Table 5 gives the estimated enrollment and FTE in the proposed program for the first five years. Year 1 enrollment is based on the current enrollment of students in PhD in EE with Computer Engineering concentration (actual enrollment numbers of students in PhD in EE with Computer Engineering concentration for Fall 2020). For the enrollment estimation for Year 2 – Year 5, it has been assumed that the current increase in enrollment rate in PhD in EE with Computer Engineering concentration will be sustained and an additional 7 students per year will be enrolled due to the new program. If the proposed PhD in Computer Engineering program is approved, it is estimated that it will have an initial enrollment of 40 students.

Table 5. Enrollment Projections

	Year 1	Year 2	Year 3	Year 4	Year 5
White	7	2	2	3	2
African American	1	0	1	0	1
Hispanic	1	1	1	2	1
International	27	4	3	3	3
Other	4	0	0	0	0
Total New Students	**40**	**7**	**7**	**7**	**7**
Attrition	2	1	1	1	1
Cumulative Headcount	**38**	**39**	**40**	**41**	**41**
FTSE	38	39	40	41	41
Graduates	5	5	5	6	6

II. Academics

A. Accreditation

The PhD in Computer Engineering program will be accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (SASCCOC) (http://www.sacs.org/). The evaluation elements include:

- student enrollment/retention;
- student learning outcomes
- scholarly output of doctoral students and faculty;
- financial support levels; and
- computing/library facilities.

B. Admissions Standards

Successful Computer Engineering PhD applicants must satisfy the University-wide graduate admission requirements described in the Graduate Catalog

(https://catalog.utsa.edu/graduate/admission/). In addition, they must satisfy, the following ECE Department-specific requirements:

- A student is expected to hold a master's degree before being granted admission to the program. Only exceptional, well prepared, and highly competitive candidates should apply to enter the PhD program directly upon receiving a bachelor's degree. The BS and MS degrees must be in Electrical Engineering or Computer Engineering. Students with degrees in related areas including Computer Science will be admitted to the program on a case by case basis. The transcripts of these students will be evaluated by the Doctoral Studies Committee (DSC) for Computer Engineering and if needed remedial courses may be recommended as a condition for admission.
- Applicants with a master's degree must have a grade point average of 3.3 or better in their master's degree program. Applicants without a master's degree program must have a grade point average of 3.3 or better in the last 60 semester credit hours of undergraduate coursework in electrical or computer engineering.
- Applicants who would like to transfer coursework from another institution or applicants admitted without an earned master's degree in electrical or computer engineering may apply a maximum of 27 semester credit hours of previously earned graduate credit toward their doctoral degree. Each student's transcript will be evaluated by the DSC and credit will be designated on a course-by-course basis to satisfy the formal coursework requirements of the degree.
- A satisfactory score, as evaluated by the DSC for Computer Engineering, is required on the Graduate Record Examination (GRE). The GRE score will be considered with other criteria in making admission or competitive scholarship decisions and will not be used as the sole criterion for consideration of the applicant or as the primary criterion to end consideration of the applicant. The GRE requirement is subject to change based on the guidelines from UTSA's Office of Strategic Enrollment.
- Students whose native language is not English must achieve a minimum score of 550 on the Test of English as a Foreign Language (TOEFL) paper-based version, 79 on the TOEFL iBT, or 6.5 on the International English Language Testing System (IELTS).
- Letters of recommendation, preferably three, attesting to the applicant's readiness for doctoral study.

A complete application includes the application form, official transcripts, letters of recommendation, GRE scores, a résumé, a statement of research experience, interests and goals, and the TOEFL or IELTS score for those applicants whose native language is not English. Admission is competitive. Satisfying these requirements does not guarantee admission.

Applications must be submitted online to UTSA. Incomplete applications will not be considered. Acceptance to the program is determined by the DSC contingent upon available funding. The DSC is comprised of graduate CE faculty members elected every 2 years. Full-time students accepted to the program are eligible for financial support in the form of competitive teaching assistantships, research assistantships, or research fellowships.

C. Program Degree Requirements

The proposed Doctoral program in Computer Engineering requires that students complete a

minimum of 54 semester credit hours beyond the master's degree. The program includes courses that have been designed to provide advanced training in areas considered to form the foundation for the discipline of Computer Engineering, namely Computer Architecture, VLSI Design and Engineering Programming. It includes 18 credit hours of courses selected among those listed below for each Computer Engineering curriculum area, 36 credit hours of Doctoral Research and Doctoral Dissertation and 2 semester credit hours of Graduate Seminar. Additional degree requirements include both passing a written qualifying examination, writing a doctoral dissertation, and passing a final examination/dissertation defense. These steps are described in detail under Section II.E. Students with only a baccalaureate degree are required to have a minimum of 81 semester credit hours to graduate. The details of the semester credit hour requirement are given in Table 6.

Table 6: Semester Credit Hour Requirements by Category

Category	SCH Entering with a Bachelor's	SCH Entering with a Master's
Required Courses	6	6
Prescribed Electives	n/a	n/a
Elective Courses	39	12
Doctoral Research and Dissertation	36	36
Other (Specify, e.g., internships, clinical work, residencies)	n/a	n/a
TOTAL[1]	**81**	**54**

[1]Texas Education Code 61.059 (l) limits funding for doctoral students to 99 SCH. Programs may be allowed to require additional SCH, if there is a compelling academic reason.

These numbers are generally consistent with the required credit hours from other CE Doctoral Programs in Texas (see Table 7).

Table 7. Semester Credit Hour Requirements for Similar Programs in Texas

Institution	Program CIP Code	Degree Program	SCH, Entering with a Bachelor's	SCH Entering with a Master's
Texas A & M University	14.0901	PhD Computer Engineering	96	64
Southern Methodist University	14.0901	PhD Computer Engineering	54	24
UT - Dallas	14.0901	PhD Computer Engineering	75	45
UT - Arlington	11.0701	PhD Computer Engineering	60	30
UT – El Paso	14.4701	PhD Computer Engineering	72	42

D. Curriculum

The educational objectives of the proposed program are (1) to produce graduates who have advanced technical knowledge in Computer Engineering and (2) to develop research and

educational skills that are essential to the growth of San Antonio and the State of Texas. Details of the curriculum of the proposed doctoral program in Computer Engineering are given below.

Table 8 shows the required core courses for all Computer Engineering PhD technical areas which will be taught once a year. Students are required to complete two out of the four courses (6 credits) listed in Table 8 based on their research focus within computer engineering. Table 10 lists the elective courses offered in all technical area, namely computer architecture, VLSI design and engineering programming. The elective courses will be taught every 2 to 4 semesters. The program will have no prescribed elective courses. The details of the required semester credit hours are given in Table 6.

Table 8. Required/Core Courses

Prefix and Number	Required/Core Course Title	SCH
EE 5123	Computer Architecture	3
EE 5113	VLSI System Design	3
EE 5103	Engineering Programming	3
EE 5193	FPGA and HDL	3

Table 9. Prescribed Elective Courses

Prefix and Number	Prescribed Elective Course Title	SCH
n/a	n/a	n/a

Table 10. Elective Courses

Prefix and Number	Elective Course Title	SCH
EE 5423.1	Parallel and Distributed Computing	3
EE 5423.2	RISC Processor Design	3
EE 5423.3	Superscalar Microprocessor Architecture	3
EE 5423.4	Fault Tolerance and Reliable System Design	3
EE 5423.5	Computer Arithmetic	3
EE 5423.6	Advanced Computer Architecture	3
EE 5423.7	HW Architecture for Machine Learning	3
EE 5423.8	Cloud Computing	3
EE 5323.1	Advanced VLSI Design	3
EE 5323.2	Low Power VLSI Design	3

EE 5323.3	VLSI Testing	3
EE 5323.4	VLSI Performance Analysis and Optimization	3
EE 5453.1	Large Domain-Specific Software Architectures.	3
EE 5453.2	Embedded Software Systems Design	3
EE 5453.3	Embedded Software Testing and Quality Assurance	3
EE 5453.4	Advanced Engineering Programming	3
EE 5453.5	Computer & Network Security	3
EE 5453.6	IOT Security	3
EE 5223.1	Graph Theory and Networking	3
EE 5223.2	Microcomputer-Based Systems	3
EE 5223.3	PCI System Design	3
EE 5163	Digital Signal Processing	3
EE 5423	Engineering Programming II	3
EE 5263.1	AI in Engineering	3
EE 5263.2	Machine Learning	3
EE 5263.3	Statistical Inference	3
EE 5263.4	Deep Learning	3
EE 5263.5	Brain Inspired AI	3
EE 5293	Analog IC Design	3
EE 6991	Research Seminar	1

The courses that are offered to the students in the current PhD in Electrical Engineering with Computer Engineering concentration is sufficient for the proposed new PhD program in Computer Engineering. Hence no new courses are needed to for the proposed program. However, since Computer Engineering is a dynamic and expanding area new courses will be added as the area of Computer Engineering evolves. For example, in Spring 2020 the ECE department offered a new course in the Computer Engineering area to address the industry need and student demand titled "Hardware Architectures for Machine Learning" (EE 5423.7). In the last few years, the ECE department added several other new courses in Computer Engineering including "Deep Learning" (EE 5263.4), "Brian Inspired AI" (EE 5263.5), "Machine Learning" (EE 5263.2), "Statistical Inference" (EE 5263.3) and "AI in Engineering" (EE 5263.3).

The full list of electives is available at:
https://catalog.utsa.edu/graduate/engineering/electricalcomputerengineering/#courseinventory

E. Candidacy and Dissertation

The following describes the steps required in the Computer Engineering PhD program for the advancement to the PhD candidacy, the dissertation, and the dissertation defense examination.

Written Qualifying Exam

The written qualifying examination is intended to test the depth of knowledge, critical thinking and technical writing skills of Computer Engineering doctoral students. Full-time students must take the written qualifying examination by the end of their second semester of study. Part-time students will take the written qualifying examination at a time dictated by the DSC. The written qualifying examination may include questions on fundamentals and applied topics related to the three Computer Engineering technical areas, namely computer architecture, VLSI Design and engineering programming. Students must be able to answer all the applied questions in their technical area and selected questions from one alternative technical area. In addition, the students may be asked to carry out a critical review of engineering research publications. The written qualifying examination is administered by the DSC with input from the faculty participating in the program. No more than two attempts to pass the written qualifying examination are permitted. Students who fail the written qualifying examination twice are terminated from the program. The results of the written qualifying examination are reported to the DSC and the Dean of the Graduate School.

Oral Qualifying Exam

Upon successful completion of the written qualifying examination, students are allowed to take Doctoral Research credit hours. Students must take their oral qualifying examination within two semesters after passing their written qualifying examination. The oral qualifying examination is a dissertation proposal defense. The dissertation proposal should describe the topic, the literature review, the proposed methodology and experimental approach, as well as highlight the novelty and potential contribution of the topic to the scientific field. The student's Dissertation Committee chair must approve the student's research proposal before scheduling the oral examination. No more than two attempts to pass the oral qualifying examination are permitted. Students who fail the oral qualifying examination twice are terminated from the program. The results of the oral qualifying examination are reported to the DSC and the Dean of the Graduate School.

Advancement to Candidacy

Upon successful completion of the oral qualifying examination, students advance to the PhD candidacy and are allowed to take Doctoral Dissertation credit hours.

Dissertation

Candidates must demonstrate their ability to conduct independent research by completing an original dissertation. The Dissertation Committee guides, critiques, and finally approves the candidate's dissertation proposal. The format of the dissertation must follow the doctoral degree regulations of the Graduate School as documented in the Graduate Catalog.

Final Oral Dissertation Defense

The final oral defense consists of a public presentation of the dissertation work by the doctoral candidate followed by a question/answer period by his/her Dissertation Committee. The

student must notify the Graduate School in writing two weeks prior to the final scheduled oral defense. Results of the oral defense are reported to the Dean of the Graduate School. Awarding of the degree is based on the approval of the candidates Dissertation Committee and the recommendation of the Dean of the Graduate School, who certifies the completion of all University wide requirements.

F. Delivery Modes, Use of Distance Technologies, and Delivery of Instruction

The proposed Computer Engineering PhD program will be delivered primarily through conventional podium lectures using electronic lecture delivery techniques. In addition, some graduate courses will be offered through distance technologies. It is noted that the ECE Departmental faculty has considerable experience in virtual classroom. Starting mid-March 2020 through Fall 2021 all classes have been taught virtually because of the Covid-19 situation. ECE faculty has used a variety of platforms to deliver the lecture remotely, including Zoom, Teams, Blackboard Collaborate and WebEx.

G. Program Evaluation

In addition to the routine annual evaluation conducted for SACSCOC, the new program will be subject to external periodic evaluations, as required by the UTSA Handbook of Operating Procedures (HOP-Section 2.39: http://utsa.edu/hop/chapter2/2-39.html).

H. Strategic Plan and Marketable Skills

The proposed Computer Engineering PhD program aligns to UTSA's vision for the future. UTSA's **Strategic Plan** is guided by three destinations and is available at (https://www.utsa.edu/strategicplan/).

Destination 1: UTSA will be a Model for Student Success
UTSA is committed to enrich student educational experiences and enable their success. The proposed Computer Engineering PhD program will:

- Improve student success by strengthening and enhancing graduate educational experiences and by preparing them to be leaders in the field of Computer Engineering. Special mentoring efforts will be made to ensure that all the students who are admitted to the Computer Engineering doctoral program are successful and that they complete the program in the timeline suggested in this proposal.
- Expand students' educational and career opportunities by training them to address a variety of engineering problems in the local and global environment, such as high-performance computing, cyber security, AI/ML, low power VLSI design etc. These are highly sought-after skills by the industry and academia and the graduates will have a solid skill set that makes them very marketable.
- Reduce barriers to student success by identifying clear pathways to candidacy and graduation for full-time and part-time students through transparent policies and procedures clearly communicated to them.
- Capitalize on existing UTSA resources intended to enhance the student experience, including the Graduate School, the Teaching and Learning Center, the Thomas Rivera center, the Writing Center, and the UTSA libraries.

- Give graduate students access to the outstanding Computer Engineering faculty members who have active research programs in computer architecture, low power VLSI design, cybersecurity, artificial intelligence and machine learning etc. In addition, the students will benefit from their interaction with faculty members from the other COE departments.
- Provide teaching assistantships that will expose graduate students to laboratory instruction under the supervision of a faculty member. Students who have an interest in pursuing academic careers and have demonstrated a thorough knowledge of a subject area may be allowed to serve as instructors to a freshman or sophomore engineering course in their area of expertise. If so, they will be mentored by an experienced faculty member and be provided with the necessary curriculum and course material. In addition, they will be mentored on how to interact with the students inside and outside the classroom and be advised on the way to evaluate student performance and learning outcomes. This will introduce them to teaching in the college environment and potentially attract some of them to a career in academia.

Destination 2: UTSA will be a Great Public Research University

The proposed Computer Engineering PhD program will contribute towards serving society by expanding research and innovation in computer architecture, VLSI Design and Software Engineering. It will, furthermore, support UTSA's mission of becoming a Tier I University in Texas and contribute towards the classification of its research activity as "Very High" by the Carnegie Foundation. The proposed program will serve as the catalyst for attracting and retaining high research caliber faculty and graduate students, who will drastically increase the overall research expenditures of the ECE Department. The proposed program will enhance teaching and research interaction within the CEID and the department of computer science and the department of information systems. The proposed Computer Engineering PhD program will encourage our Computer Engineering doctoral students to interact with their counterparts at other CEID departments, offering them a unique multidisciplinary research experience.

Destination 3: UTSA will be an exemplar for strategic growth and innovative excellence

Destination 3 states, "UTSA will realize its full potential as a university by growing enrollment and infrastructure while focusing on innovation and continuous improvement. UTSA actively cultivates the excellence of its people, and places an emphasis on increasing the diversity of its leadership and faculty in order to reflect the community it serves."

This program exemplifies strategic growth by capitalizing on student demand, a robust job market, and current faculty expertise. The PhD in Computer Engineering is a strategic way to technological need of San Antonio, The state of Texas and the nation.

The proposed PhD in Computer Engineering also aligns with UTSA goals in the following:

School of Data Science & National Security Collaboration Center. The proposed PhD in Computer Engineering is expected to play a major role in UTSA's proposed School of Data Science. The School of Data Science will have faculty members in cybersecurity, cloud computing, data and analytics, and artificial intelligence. The students trained in Computer Engineering and in the school of Data Science will have highly marketable skills.

Serving the Public through Community Engagement. Community engagement at UTSA is the active involvement of the university community through its faculty, staff, students, and alumni in strategic partnerships with the broader community to enrich learning and research, to prepare engaged citizens, and to contribute to the public good. Community engagement values a culture of openness and access, creating value and improved quality of life, active communication and collaboration with community stakeholders, and positive constituent services at all levels. Engagement initiatives work to transform the lives of individuals and communities through active involvement with UTSA's stakeholders by building relationships, conducting dialogue focused on common goals, and extending university knowledge, resources and expertise that contribute toward the advancement of society. The goals that address engagement with our communities:

- The proposed program will engage community employers through dialogue, internships, and other cooperative learning experiences to ensure that UTSA graduates are prepared to enter the future workforce and play leadership roles in the globally competitive knowledge economy.
- The proposed program will stimulate social and economic development through activities such as outreach, service, and collaborative research and commercialization programs that respond to community needs and align with the UTSA mission.
- The proposed program will enhance the local community's global role by serving as a resource for sharing global understanding and perspectives such as linkages with our international exchange student program, international faculty, and global research activities.
- The labor provided by students in the program will benefit the community in several important ways. Students working as graduate interns will be able to use their quantitative and methodological skills to assist in a variety of research projects.

Promoting Access and Affordability. The proposed program will contribute to UTSA's mission of providing affordable graduate education to minority students. UTSA has been in the forefront of training Hispanic minority students at both the undergraduate and graduate levels. An additional effort will be made to attract African American students to the new program by leveraging existing recruitment funds with additional minority student scholarships. This strategy has been successful already for the existing PhD in Electrical Engineering program. Affordability will be promoted by leveraging existing scholarship, teaching assistantship and research funding to offset student tuition and living expenses. Hence, the proposed doctoral program in Computer Engineering will promote access and affordability to a large minority population and provide them the resources for professional and social advancement.

With regard to **marketable skills,** graduates will have strong background in computer architecture, VLSI Design, AI/ML, Hardware Security, Cybersecurity and Software Engineering. Our graduates will have an ability to identify, formulate, and solve complex computer engineering problems by applying principles of engineering, science, and mathematics, an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions, an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments.

Several of our students obtain internship or co-op positions in high tech companies such as Intel, AMD, Samsung, Apple, IBM, Qualcomm, Broadcom, Xilinx etc. Through these internships/Co-ops they also gain valuable industrial experience. Students in the PhD in Electrical Engineering program who graduated with Computer Engineering concentration have been highly successful in obtaining industry as well academic positions in the past. Table 2 above gives the list of PhD EE graduates with computer engineering concentration and their first appointment.

I. Related and Supporting Programs

The PhD program in Computer Engineering is associated with the following programs administered by the ECE Department and Computer Science department.

- BS in Electrical Engineering
- BS in Computer Engineering
- BS in Computer Science
- MS in Electrical Engineering
- MS in Computer Engineering
- MS in Computer Science

Both the BS (Electrical Engineering) and BS (Computer Engineering) programs are separately ABET accredited. Table 11 shows performance statistics of these six supporting programs.

Table 11. Related and Supporting Programs

	2015-16	2016-17	2017-18	2018-19	2019-20
BS in Electrical Engineering					
Applications	389	373	402	372	385
Admissions	329	324	343	324	319
Enrollment	407	416	424	456	423
Graduates	95	112	84	92	99
BS in Computer Engineering					
Applications	492	457	517	462	492
Admissions	392	375	426	384	392
Enrollment	258	276	292	300	307
Graduates	15	26	39	33	55
BS in Computer Science					
Applications	852	1024	1090	1136	1175
Admissions	713	875	957	988	1000
Enrollment	865	849	834	1022	1312
Graduates	92	108	169	185	189
MS in Electrical Engineering					
Applications	184	197	131	86	52
Admissions	156	177	130	85	50
Enrollment	117	114	76	71	61
Graduates	73	54	25	27	24
MS in Computer Engineering					
Applications	75	63	47	31	28
Admissions	63	61	46	31	28

Enrollment	48	38	37	39	26
Graduates	34	19	16	15	13
MS in Computer Science					
Applications	244	319	196	222	149
Admissions	43	107	138	159	120
Enrollment	98	79	69	74	77
Graduaties	44	32	22	22	40

J. Existing Doctoral Programs

UTSA offers 25 PhD programs across 7 Colleges. The College of Engineering and Integrated Design (CEID) administers five of these programs, which are listed below.

- Biomedical Engineering (BME)
- Civil Engineering (CE)
- Electrical Engineering (EE)
- Environmental Science and Engineering (ESE)
- Mechanical Engineering (ME)

A full list of all the doctoral programs offered by UTSA is given at:
https://graduateschool.utsa.edu/programs/category/doctoral-degree/

The ECE Department administers the PhD EE program since 2002. The proposed Computer Engineering PhD program will further strengthen the existing research ties between UTSA's mechanical engineering, civil engineering, biomedical engineering, environmental science and engineering and chemical engineering faculty. The proposed Computer Engineering PhD program will allow Computer Engineering doctoral students to interact with their counterparts at other CEID departments, offering them a unique multi-disciplinary research experience.

K. Recent Graduates Employment

Tables 12 and 13 shows the percentage of alumni employed and where they are employed (academia, government, or industry).

Table 12: Master's students' employment after graduation (MS-EE and MS-CE)

	2016-2017		2017-2018		2018-2019		2019-2020		2020-2021	
	#	%	#	%	#	%	#	%	#	%
Employment in Private Business	26	61.9%	12	48.0%	17	58.6%	22	78.6%	12	52.2%
Employment in Government Business	2	4.8%	2	8.0%	4	13.8%	2	7.1%	2	8.7%
Employment in Other Agency	8	19.0%	9	36.0%	4	13.8%	1	3.6%	5	21.7%
Doctoral Program at UTSA	4	9.5%	2	8.0%	4	13.8%	1	3.6%	3	13.0%
Doctoral Program at Another School	0	0.0%	0	0.0%	0	0.0%	1	3.6%	0	0.0%

Other	2	4.8%	0	0.0%	0	0.0%	1	3.6%	1	4.3%
Total	**42**	**100.0%**	**25**	**100.0%**	**29**	**100.0%**	**28**	**100.0%**	**23**	**100.0%**

Table 13: Doctoral students' employment after graduation (PhD in Electrical Engineering)

	2016-2017		2017-2018		2018-2019		2019-2020		2020-2021	
	#	%	#	%	#	%	#	%	#	%
Faculty member at institution of higher education	0	0.0%	3	27.3%	1	33.3%	2	33.3%	5	38.5%
Employment in private business	2	28.6%	6	54.5%	1	33.3%	2	33.3%	3	23.1%
Employment in Other Agency	1	14.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Post-doctoral appointment	3	42.9%	1	9.1%	1	33.3%	2	33.3%	2	15.4%
Other	1	14.3%	1	9.1%	0	0.0%	0	0.0%	3	23.1%
Total	**7**	**100.0%**	**11**	**100.0%**	**3**	**100.0%**	**6**	**100.0%**	**13**	**100.0%**

III. Faculty

A. Faculty Availability

The Department of Electrical and Computer Engineering (ECE) currently has 26 tenured/tenure track faculty members that direct both Master's and PhD students. The department is expected to add another 3 ECE faculty members by Fall 2022. Table 14 lists the names of the core ECE Department faculty, their highest degree and awarding institution, and year of graduation, as well as the Doctoral Computer Engineering courses assigned to each and the percent effort contribution to the proposed Computer Engineering PhD program. The latter is calculated by assigning 10% effort to each graduate course offered and another 5% for each PhD student supervised (e.g., teaching two doctoral courses and supervising two PhD students per year represents a 30%-time commitment to the program). Similarly, Table 15 lists the names of the CE PhD program support faculty, their highest degree and awarding institution, as well as the Doctoral CE courses assigned to each and the percent effort contribution to the proposed CE PhD program. It is noted that support faculty for the proposed CE PhD program are from the ECE department who are not in the Computer Engineering concentration.

Table 14. Core Faculty

Name and Rank of Core Faculty	Highest Degree and Awarding Institution	Courses Assigned in Program	% Time Assigned

			to Program
Alamaniotis, Miltos Assistant Professor	PhD in Nuclear Engineering, Purdue University	EE 5263.1 EE 5553	15%
Banerjee, Taposh Assistant Professor	PhD in Electrical & Computer Engineering, University of Illinois at Urbana - Champaign	EE 5263.2 EE 5263.3 EE 5563	55%
Chen, Guenevere Assistant Professor	PhD In Electrical & Computer Engineering, Mississippi State University	EE 545.23 EE 5453.6	55%
Choo, Kim-Kwang Professor	PhD in Information Security, Queensland University of Technology	EE 5453.1	10%
Ciocarlie, Gabirela Assistant Professor	PhD in Computer Science, Columbia University	EE 5453.4 EE 5523	55%
Flores, Mario Assistant Professor	PhD in Electrical Engineering, The University of Texas at San Antonio	EE 5263.5 EE 5573	10%
Gong, Yanmin Assistant Professor	PhD in Electrical & Computer Engineering, University of Florida	EE 5263.4 EE 5283.4	55%
Guo, Yuanxiong Assistant Professor	PhD in Electrical & Computer Engineering, University of Florida	IS 6733/EE 5263 EE 5553	10%
*John, Eugene Professor	PhD in Electrical Engineering, The Pennsylvania State University	EE 5113 EE 5323 EE 5423.3 EE 5423.7	55%
Krishnan, Ramnarayan Associate Professor	PhD in Information Technology, George Mason University	EE 5103 EE 5453.4 EE 5453.5	10%
Kudithipudi, Dhireesha Professor	PhD in Electrical Engineering, The University of Texas at San Antonio	EE 5263.3 EE 6991 EE 7931	55%
Lin, Wei-Ming Professor	PhD in Electrical Engineering, University of Southern California	EE 5123 EE 5193 EE 5223.5 EE 5423.6	55%
Najafirad, Peyman Associate Professor	PhD in Electrical Engineering, The University of Texas at San Antonio	EE 5523	10%
Prevost, John Jeffrey Assistant Professor	PhD in Electrical Engineering, The University of Texas at San Antonio	EE 5423.8 EE 5453.7 EE 5523	55%
Sutherland, Tyler Assistant Professor	PhD in Physics, Purdue University	EE 5573	10%

*Graduate Advisor of Record (GAR) for proposed program.

Table 15. Support Faculty

Name and Rank of Support Faculty	Highest Degree and Awarding Institution	Courses Assigned in Program or Other Support Activity	% Time Assigned to Program
Ahmed, Sara Assistant Professor	PhD in Electrical Engineering, Virginia Polytechnic Institute and State University	EE 6991 EE 6071	5%
Ahn, Ethan Assistant Professor	PhD in Electrical Engineering, Stanford University	EE 5503	5%
Akopian, David Professor	PhD in Signal and Image Processing, Tampere University of Technology	EE 5373	5%
Guo, Ruyan Professor	PhD in Solid State Science, The Pennsylvania State University	EE 5693	5%
Jamshidi, Mohammad Professor	PhD in Electrical Engineering, University of Illinois at Urbana - Champaign	EE 5243.5	5%
Jin, Yufang Professor	PhD in Electrical Engineering, University of Central Florida	EE 5243.2	5%
Kelley, Brian Associate Professor	PhD in Electrical Engineering, Georgia Institute of Technology	EE 5283.3	5%
Qian, Chunjiang Department Chair, Professor	PhD in Electrical/Computer Engineering, Case Western Reserve University	EE 5443	5%
Shadaram, Mehdi Professor	PhD in Electrical Engineering, The University of Oklahoma	EE 5183	5%
Walton, Claire Assistant Professor	PhD in Applied Mathematics and Statistics, University of California, Santa Cruz	EE 5243.2	5%
Zhang, Michelle Associate Professor	PhD in Electrical Engineering, State University of New York at Stony Brook	EE 5263.2 EE 5243.6	5%

B. Teaching Load

The core faculty participating in the proposed PhD program have an average organized course teaching load of 24.6 Semester Credit Hours per year (SCH/year). The typical teaching load in the Department of Electrical and Computer Engineering for tenure-track faculty is 2-2, with a typical workload of 40% Teaching, 40% Research, and 20% Service. The teaching load of research intense faculty is 2-1, with a typical workload of 30% Teaching, 50% Research, and 20% Service. We anticipate to continue the 2-2 or 2-1 teaching load to core and support faculty teaching in the proposed program, to allow faculty to continue working on their own research while also supervising students' research. All of the courses in the doctoral curriculum

have already been developed and can be covered by existing faculty.

C. Core Faculty Productivity

Table 16 summarizes scholarly productivity measures for the current core and support faculty of the proposed Computer Engineering PhD program for the past five years. The table lists the number of journal publications and other scholarly accomplishments. This data covers a five-year period from Fall semester 2016 to Summer semester 2021. Table 17 shows the external grant awards for each core and support faculty member for the past 5 years. It should also be noted that the department currently has four NSF CAREER Award recipients. Figure 2 gives the Academic Analytic radar plot for the department of Electrical and Computer Engineering.

Table 16: Publications and Other Scholarly/Creative Accomplishments for the Past Five Years for Core and Support Faculty

Faculty Name	Refereed Papers	Book Chapters	Books	Juried Creative/ Performance	Patents
Core Faculty					
Alamaniotis, Miltos	57	10	0	0	0
Banerjee, Taposh	22	0	0	0	0
Ciocarlie, Gabriela	3	0	0	0	0
Flores, Mario	2	0	0	0	0
Gong, Yanmin	37	1	0	0	0
John, Eugene	37	0	0	0	5
Krishnan, Ram	32	4	0	0	2
Kudithipudi, Dhireesha	14	0	0	0	1
Lin, Wei-Ming	22	0	2	0	0
Prevost, Jeff	28	1	0	0	0
Sutherland, Tyler	11	0	0	0	1
Support Faculty					
Ahmed, Sara	40	0	0	0	10
Ahn, Ethan	33	0	0	0	2
Akopian, David	63	2	0		11
Arslan, Fatma	2	0	0	0	0

Benavidez, Patrick	33	2			2
Bhalla, Amar	77	0	0	0	1
Cao, Yongcan	35	1	0	0	0
Gatsis, Nikolaos	66	1	0	0	5
Grigoryan, Artyom	44	4	3	0	3
Guo, Ruyan	86	0	3	0	3
Jamshidi, Mohammad	55	7	4	0	5
Jin, Yufang	28	0	0	0	0
Kelley, Brian	20	0	0	0	2
Qian, Chunjiang	59	0	0	0	0
Shadaram, Mehdi	28	0	1	0	1
Walton, Claire	20	0	0	0	0
Zhang, Michelle	10	0	0	0	0

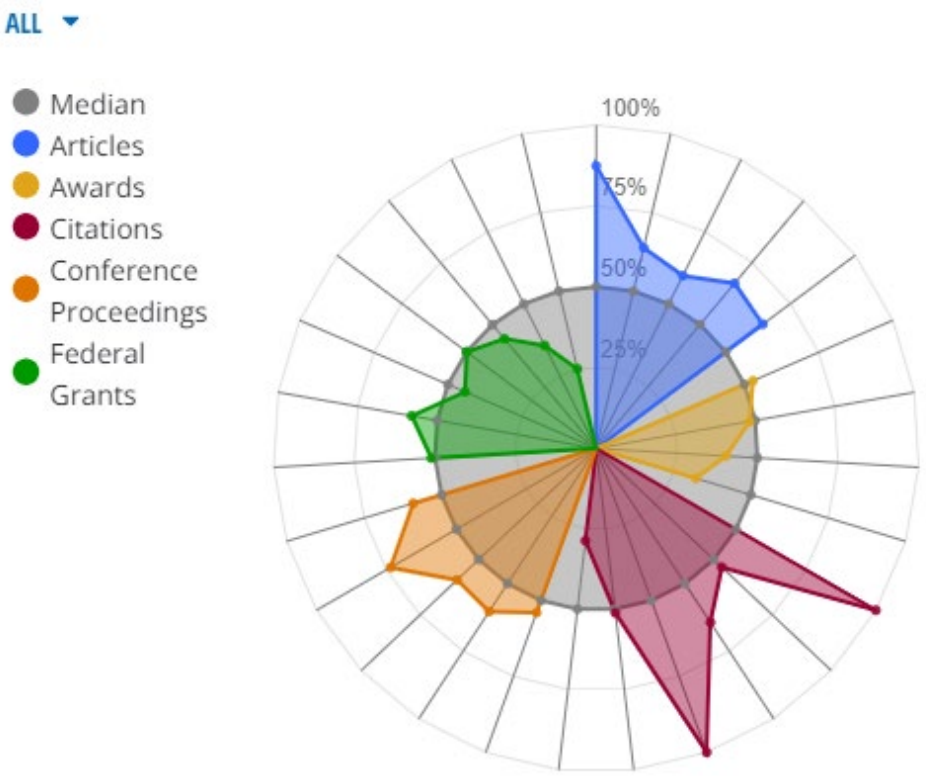

Figure 2 : *Academic Analytic Radar plot for the department of Electrical and Computer Engineering*

Table 17. External Grant Awards for the Past Five Years

Faculty Name	Grant Source	Grant Subject	Dates	Total Grant Amount	Institutional Amount
Core Faculty					
Alamaniotis, Miltiadis	Department of Energy - DOE	CONNECT- the CONsortium on Nuclear sECurity Technologies	9/1/2019 8/31/2022	$2,999,995.00	$2,999,995.00
Alamaniotis, Miltiadis	National Science Foundation - NSF	REU Site: Artificial Intelligence Powered Robotics in 5G Network	4/1/2021 3/31/2024	$403,354.00	$403,354.00
Alamaniotis, Miltiadis	US Nuclear Regulatory Commission - NRC	UTSA Faculty Development in Cybersecurity of Digital I&C in Nuclear Power Plants Research and Education	10/1/2020 9/30/2023	$300,000.00	$300,000.00

Alamaniotis, Miltiadis	San Antonio Medical Foundation	Predicting Stroke Hemorrhagic Conversion with a Novel Machine Learning Algorithm	7/1/2020 6/30/2021	$131,340.00	$131,340.00
Alamaniotis, Miltiadis	Argonne National Laboratory	Development of Sensor Performance Model of MicroWAVE Cavity Flow Meter for Advanced Reactor High Temperature Fluids	10/1/2020 9/30/2023	$99,968.00	$99,968.00
Alamaniotis, Miltiadis	Kaneka North America LLC	Indoor Air Quality (IAQ) assessment of adhesive materials & airtightness performance of air-sealing materials using mock-up building structures	1/1/2021 11/30/2021	$16,100.00	$16,100.00
Alamaniotis, Miltiadis	City Public Service	Self-adaptive Protection of Inverter-based Power Systems using Explainable Artificial Intelligence (AI)	3/1/2022 8/31/2023	$400,000.00	$400,000.00
Banerjee, Taposh	Army Research Lab	Real-Time Anomaly Detection Using Multi-Modal Data	9/1/2018 8/31/2021	$280,739.00	$280,739.00
Banerjee, Taposh	National Science Foundation - NSF	Optimal Sensor Selection and Robust Traffic Detection and Estimation in a World of Connected Vehicles	6/1/2019 5/31/2022	$282,922.00	$282,922.00
Banerjee, Taposh	National Science Foundation - NSF	EAGER: Exploring Artificial Intelligence Techniques for Energy-Efficient Arrhythmia Detection and Identification in Connected Implantable Cardiac Devices	8/1/2020 7/31/2021	$286,000.00	$286,000.00
Banerjee, Taposh	Army Research Lab	Distributed Learning and Control for Multi-Domain, Multi-Modal, and Non-Stationary Data	9/13/2021 9/12/2024	$302,429.00	$302,429.00
Banerjee, Taposh	Vanderbilt University	Traffic congestion mode detection and identification	8/1/2021 7/31/2022	$60,000.00	$60,000.00
Chen, Qian	National Science Foundation - NSF	RIA:Towards Realizing a Self-Protecting Healthcare Information System for the Internet of Medical Things	9/1/2017 8/31/2020	$280,221.00	$280,221.00
Chen, Qian	University of Texas System	Internet of Things Security & Forensics Lab	6/1/2018 5/31/2019	$86,010.00	$86,010.00

Chen, Qian	US Department of Energy - 270	AI in Cybersecurity Education Partnership (ACEP)	9/1/2020 8/31/2025	$4,949,001.00	$4,949,001.00
Chen, Qian	UTSA Office of Vice Prisdent Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	SALSI: Enhancing Safety and Security of Clinical Alarm Systems: An interdisciplinary Cyber-Physical-Human Analysis	6/1/2018 5/31/2019	$50,000.00	$50,000.00
Chen, Qian	United States Department of the Air Force - USAF	B2CSM: Blockchain-Based Cyber Security Management: Design, Analysis, and Prototype Implementation	1/1/2019 12/31/2019	$124,790.00	$124,790.00
Chen, Qian	National Science Foundation - NSF	NSF INCLUDES DCL: Traineeship Supplements	6/1/2019 4/30/2020	$53,813.00	$53,813.00
Chen, Qian	Sandia National Laboratories (SNL)	Detailed Statistical Models of Host-Based Data to Detect Malicious Activities	9/1/2020 8/31/2025	$4,949,001.00	$4,949,001.00
Flores, Mario	UTSA Office of Vice President Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	Microphysiological models of the upper airway to evaluate pathogen resistance	9/1/2021 8/31/2022	$20,000.00	$20,000.00
Gong, Yanmin	National Science Foundation - NSF	CRII: NeTS: Embracing Dynamic Spectrum Sharing without Privacy Concerns	9/1/2019 9/1/2021	$175,000.00	$175,000.00
Gong, Yanmin	National Science Foundation - NSF	REU Supplement: CRII: NeTS: Embracing Dynamic Spectrum Sharing without Privacy Concerns	10/1/2019 9/30/2020	$16,000.00	$16,000.00
Gong, Yanmin	National Science Foundation - NSF	CV19: RAPID: Collaborative Research: Location Privacy Preserving COVID-19 Symptom Map Construction via Mobile Crowdsourcing for Proactive Constrained Resource Allocation	6/1/2020 5/31/2021	$100,000.00	$100,000.00
Gong, Yanmin	Department of Defense -DOD	A Flexible Testbed for Cyber Deception, Cyber Hardening, and Disinformation Research	7/1/2021 6/30/2022	$472,921.00	$472,921.00

Gong, Yanmin	National Science Foundation - NSF	CAREER: Ubiquitous and Time-Critical Federated Learning with Cooperative Mobile Edge Networking	9/1/2021 8/31/2026	$509,014.00	$509,014.00
Gong, Yanmin	National Science Foundation - NSF	Collaborative Research: CNS Core: Medium: Towards Federated Learning over 5G Mobile Devices: High Efficiency, Low Latency, and Good Privacy	6/1/2021 5/31/2024	$250,000.00	$250,000.00
Gong, Yanmin	UTSA Office of Vice Prisdent Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	GREAT: Regional Natural Hazard Risk Assessment Methodology toward Resilient 5G Telecommunication Infrastructure Deployment	10/1/2021 7/31/2022	$20,000.00	$20,000.00
John, Eugene	National Institutes of Health - NIH	Ultra-Low Power Computing for Next Generation Implantable Smart Cardiac Pacemakers	1/1/2018 12/31/2021	$441,000.00	$441,000.00
John, Eugene	National Science Foundation - NSF	EAGER: Exploring Artificial Intelligence Techniques for Energy-Efficient Arrhythmia Detection and Identification in Connected Implantable Cardiac Devices	8/1/2020 7/31/2021	$286,000.00	$286,000.00
John, Eugene	Semiconductor Research Corporation	Machine Learning Workload Analysis and Characterization	1/1/2021 12/31/2023	$109,500.00	$109,500.00
Krishnan, Ramnarayan	National Science Foundation - NSF	NSF Student Travel Grant for 2017 Secure Knowledge Management Workshop (SKM)	6/30/2017 5/29/2018	$12,142.00	$12,142.00
Krishnan, Ramnarayan	National Science Foundation - NSF	CREST Center for Security and Privacy Enhanced Cloud Computing (C-SPECC)	9/1/2017 8/31/2022	$5,000,000.00	$5,000,000.00
Krishnan, Ramnarayan	National Science Foundation - NSF	Secure Knowledge Management Workshop	10/1/2021 9/30/2022	$14,140.00	$14,140.00
Kudithipudi, Dhireesha	Rochester Institute of Technology	PIC: Hybrid Silicon Electronic-Photonic Integrated Neuromorphic Networks	9/1/2019 8/31/2021	$98,576.00	$98,576.00
Kudithipudi, Dhireesha	Seagate Technology LLC	Neuromorphic Hierarchical Temporal Memory Architecture	11/1/2019 10/31/2020	$65,193.00	$65,193.00

Kudithipudi, Dhireesha	Argonne National Laboratory	Dynamic Architectures through Introspection and Neuromodulation (DAIN)	11/26/2019 8/23/2023	$369,549.00	$369,549.00
Kudithipudi, Dhireesha	Rochester Institute of Technology	Biofidelic Spatio-Temporal Activity Recognition	9/1/2020 8/31/2021	$93,320.00	$93,320.00
Kudithipudi, Dhireesha	United States Department of the Air Force - USAF	Genesis: A Neuromophic Chip with Continual Learning On-Device	3/1/2020 9/30/2022	$1,009,391.00	$1,009,391.00
Kudithipudi, Dhireesha	United States Department of the Air Force - USAF	Genesis: Physical Design Library Development for Continual Learning	6/1/2021 9/20/2023	$150,000.00	$150,000.00
Kudithipudi, Dhireesha	Seagate Technology LLC	Next-Generation Sparse Neuromorphic Architectures for the Edge	10/1/2021 9/30/2022	$69,750.00	$69,750.00
Kudithipudi, Dhireesha	United States Department of the Air Force - USAF	Advanced Capabilities for Cyber Resilient and Assured Missions (ACCRAM)	10/1/2020 9/30/2025	$18,196,393.00	$18,196,393.00
Kudithipudi, Dhireesha	Sandia National Laboratories (SNL)	ARNIE Autonomous Reconfigurable Neural Intelligence at the Edge	11/2/2021 9/30/2023	$149,990.00	$149,990.00
Sutherland, Robert	Lawrence Livermore National Laboratory	All-electronic ion qubits (AEIQ)	10/1/2020 12/31/2022	$135,000.00	$135,000.00
Sutherland, Robert	Lawrence Livermore National Laboratory	Quantum Computing with Trapped Electrons (QuTE)	11/1/2020 11/1/2021	$20,000.00	$20,000.00
Support Faculty					
Ahmed, Sara	UTSA Office of Vice President Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	CONNECT: Promoting Sustainability and Safety for Texas Rural Roadways Through Self-Powered Sensing and Detection Systems	9/1/2017 8/31/2018	$50,000.00	$50,000.00
Ahmed, Sara	City Public Service	A Hybrid Integrated Sensing and Energy Conversion (HISEC) System for Harvesting Mechanical and Thermal Energy from Roadways	9/1/2017 8/31/2019	$596,986.00	$596,986.00
Ahmed, Sara	Louisiana State University - LSU	Smart Charging of Future Electric Vehicles Using Roadway Infrastructure	4/1/2018 9/30/2019	$40,000.00	$40,000.00

Ahmed, Sara	UTSA Office of Vice Prisdent Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	GREAT: Enhanced stability, protection and control for low-inertia power grids	9/1/2018 8/31/2019	$20,000.00	$20,000.00
Ahmed, Sara	UTSA Office of Sustainability - UTSA OS	Promoting Sustainability and Safety for University of Texas at San Antonio Through Self-Powered Sensing, Warning and Detection Systems.	4/1/2019 3/31/2020	$38,921.00	$38,921.00
Ahmed, Sara	City Public Service	Supercritical Carbon Dioxide (sCO2) Power Generation for Renewable Energy Extraction	9/1/2019 8/31/2021	$800,000.00	$800,000.00
Ahmed, Sara	Louisiana State University - LSU	Development of a Self-Powered Weigh-In-Motion (WIM) System	4/1/2019 9/30/2020	$49,943.00	$49,943.00
Ahmed, Sara	Louisiana State University - LSU	Development of a low power, low-cost rural railway intersection smart detection and warning system	8/15/2019 1/14/2021	$50,000.00	$50,000.00
Ahmed, Sara	National Science Foundation - NSF	ICORPS: Self-powered Low-Cost Smart Traffic Detection and Warning System	7/13/2020 7/13/2021	$50,000.00	$50,000.00
Ahmed, Sara	Louisiana State University - LSU	TranSET: A multi-AI-agent framework for vehicle-infrastructure integration and electric vehicle robust charging.	4/1/2020 9/30/2021	$40,000.00	$40,000.00
Ahmed, Sara	National Science Foundation - NSF	REU Site: Artificial Intelligence Powered Robotics in 5G Network	4/1/2021 3/31/2024	$403,354.00	$403,354.00
Ahmed, Sara	Astroport Space Technologies	STTR: Induction Furnace-Nozzle for Forming and Placing Lunar Regolith Bricks for Landing Pad Construction	5/3/2021 5/27/2022	$38,837.00	$38,837.00
Ahmed, Sara	City Public Service	Self-adaptive Protection of Inverter-based Power Systems using Explainable Artificial Intelligence (AI)	3/1/2022 8/31/2023	$400,000.00	$400,000.00
Ahn, Ethan	Louisiana State University - LSU	Smart Charging of Future Electric Vehicles Using Roadway Infrastructure	4/1/2018 9/30/2019	$40,000.00	$40,000.00

Ahn, Ethan	UTSA Office of Vice President Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	GREAT: A Full-Stack Solution for NVM-Based Deep Learning Acceleration	9/1/2018 8/31/2019	$20,000.00	$20,000.00
Ahn, Ethan	Department of Defense -DOD	All-spin Logic enabled by 2D Materials	1/1/2019 12/31/2021	$444,951.00	$444,951.00
Ahn, Ethan	National Science Foundation - NSF	EAGER: Feasibility Investigation of Epitaxial Oxide Resistive FET (EOR-FET)	6/1/2019 5/31/2020	$99,853.00	$99,853.00
Ahn, Ethan	UTSA Office of Vice President Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	T2: Transdisciplinary Investigation of Electromechanical Coupling-driven Properties of New 2D Materials	9/1/2019 8/31/2020	$20,000.00	$20,000.00
Ahn, Ethan	UTSA Office of Vice President Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	Seed Funding: Fabrication of an Innovative Nanopore Microneedle for Controlled Gene Transfection within 3D Cell Volumes	1/15/2020 7/15/2020	$15,000.00	$15,000.00
Ahn, Ethan	Korea Electrotechnology Research Institute	Study on Smart, Self-powered Sensors Applicable to Power System Diagnosis	9/1/2020 11/6/2020	$10,000.00	$10,000.00
Ahn, Ethan	UTSA Office of Vice President Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	Fabrication of an Innovative Nanopore Microneedle for Controlled Electroporation and Gene Transfection	3/1/2021 7/31/2021	$0.00	$0.00
Akopian, David	University of Texas Health Science Center San Antonio	Tobacco Cessation Services for Bi-Lingual and Spanish Speaking Young Adult Latinos in South Texas	8/31/2014 8/30/2017	$181,379.00	$181,379.00
Akopian, David	University of Tennessee at Chattanooga	Extending GPS operation in GPS-denied areas through cross-correlation jamming cancellation	12/31/2016 12/31/2016	$76,000.00	$76,000.00
Akopian, David	University of Texas at Austin	Healthy Frio: A Rural Community Partnership to Advance Latino Obesity Research	4/1/2016 3/31/2021	$510,382.00	$510,382.00

Akopian, David	University of Texas Health Science Center San Antonio	Improving Adherence to Endocrine Hormonal Therapy among Breast Cancer Patients	4/1/2016 3/31/2017	$54,840.00	$54,840.00
Akopian, David	National Science Foundation - NSF	ICORPS: Fast Deployment Service for Automated Business-to-Client Interactive Messaging	6/15/2017 12/14/2017	$50,000.00	$50,000.00
Akopian, David	National Science Foundation - NSF	CIF: Small: Integrated Framework for Detection and Mitigation of GPS Spoofing Attacks in Smart Grids	9/1/2017 8/31/2020	$399,934.00	$399,934.00
Akopian, David	University of Texas Health Science Center San Antonio	Mobile Cessation Services for Young Adult Rural, Low-Income & Spanish Speaking Smokers	8/31/2017 8/30/2020	$164,769.00	$164,769.00
Akopian, David	UTSA Office of Vice President Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	MindfullyAdherent: A Tailored mHealth Intervention to Optimize Medication Adherence for Opioid Use Disorder	8/1/2018 7/31/2019	$25,000.00	$25,000.00
Akopian, David	University of Texas Health Science Center San Antonio	Mobile Cessation Services for Young Adult Rural, Low-Income & Spanish Speaking Smokers - Extra Support	8/31/2017 8/30/2020	$90,000.00	$90,000.00
Akopian, David	University of Texas Health Science Center San Antonio	(Komen) Improving Adherence to Endocrine Hormonal Therapy among Breast Cancer Patients Year 2	12/12/2018 3/31/2019	$54,840.00	$54,840.00
Akopian, David	University of Texas Health Science Center San Antonio	Tobacco Services for Primary Care Patients at UT Health San Antonio	8/31/2018 8/30/2021	$274,301.00	$274,301.00
Akopian, David	National Science Foundation - NSF	Planning Grant: Engineering Research Center for Sustainable Urban Ecosystems	9/1/2019 8/31/2020	$100,000.00	$100,000.00
Akopian, David	University of Texas Health Science Center San Antonio	(Komen) Improving Adherence to Endocrine Hormonal Therapy among Breast Cancer Patients Years 3 and 4	4/1/2019 3/31/2021	$54,840.00	$54,840.00
Akopian, David	National Aeronautics and Space Administration - NASA	City-based Integrated Engineering Training Alliance to Engage, Educate and Empower the Next Generation STEM Workforce	7/21/2020 11/21/2020	$50,000.00	$50,000.00

Akopian, David	US Nuclear Regulatory Commission - NRC	UTSA Faculty Development in Cybersecurity of Digital I&C in Nuclear Power Plants Research and Education	10/1/2020 9/30/2023	$300,000.00	$300,000.00
Akopian, David	City of San Antonio - Texas	SPUR COSA EPICS Research Fellows	10/1/2021 9/30/2022	$24,500.00	$24,500.00
Benavidez, Patrick	Bank of America N.A.	LOITERING ALERT SYSTEM FOR AUTOMATED TELLER MACHINE (ATM) VESTIBULES	7/25/2017 1/25/2018	$131,825.00	$131,825.00
Benavidez, Patrick	Department of Defense -DOD	SNAP Drone: Modular 3D Printed Packable Quadcopter Assembled in a Snap	2/1/2019 7/31/2019	$6,791.00	$6,791.00
Benavidez, Patrick	North Carolina Agricultural & Technical State University	MODELING, ANALYSIS AND CONTROL OF LARGE-SCALE AUTONOMOUS SYSTEM OF VEHICLES	4/8/2015 4/9/2021	$1,208,800.00	$1,208,800.00
Benavidez, Patrick	Department of Defense -DOD	Rowdy Robots -- Autonomous Wet Gap Crossing Agents	1/31/2020 7/31/2020	$11,995.00	$11,995.00
Bhalla, Amar	FBD Partnership LP	Project 2 - Measured Attribute Effect on Drink Properties	9/30/2016 5/15/2017	$36,000.00	$36,000.00
Bhalla, Amar	Boral IP Holdings LLC	Non-Destructive Evaluation Technologies for Product Fabrication and Assessment	9/1/2016 8/31/2017	$25,000.00	$25,000.00
Bhalla, Amar	National Science Foundation - NSF	Conference Support for the Fourteenth International Meeting on Ferroelectricity	6/1/2017 12/31/2017	$6,000.00	$6,000.00
Bhalla, Amar	City Public Service	A Hybrid Integrated Sensing and Energy Conversion (HISEC) System For Harvesting Mechanical and Thermal Energy from Roadways	9/1/2017 8/31/2019	$596,986.00	$596,986.00
Bhalla, Amar	Boral IP Holdings LLC	Non-Destructive Evaluation Technologies for Product Fabrication and Assessment	4/1/2018 3/31/2019	$36,000.00	$36,000.00
Bhalla, Amar	FBD Partnership LP	Project 3. Deriving Mathematical Models and Feedback Solutions	4/1/2018 12/31/2018	$46,800.00	$46,800.00
Bhalla, Amar	Hall Labs	Additive Manufacturing & Sintering Project	12/3/2018 9/3/2019	$45,000.00	$45,000.00

Cao, Yongcan	United States Department of the Air Force - USAF	Dynamic Data-Driven Intelligence, Surveillance, and Reconnaissance Using Cooperative Heterogeneous Teams: from Individual Sensor-driven System to Cooperative Information-driven System	1/1/2016 12/31/2018	$50,918.00	$50,918.00
Cao, Yongcan	UTSA Office of Vice President Research, Economic Development, and Knowledge Enterprise Office - VPR - REDKE	PEP: Human-inspired Decision Making for Swarm Robotics	4/1/2017 8/31/2017	$19,821.00	$19,821.00
Cao, Yongcan	United States Department of the Navy (DN)Â	Human-Inspired Decision Making for Swarm Robots	6/1/2017 5/31/2020	$507,388.00	$507,388.00
Cao, Yongcan	United States Department of the Navy (DN)	An Active Learning Approach for Precise and Reliable UAV Formation Maneuvers	9/1/2018 8/31/2022	$452,267.00	$452,267.00
Cao, Yongcan	Omega Optics Inc	SBIR: Algorithms for Data Fusion of Signals from Photonic Chemical and Biological Sensor for Unmanned Aerial Vehicles	9/1/2018 2/28/2019	$25,000.00	$25,000.00
Cao, Yongcan	City Public Service	Development of Autonomous Soft Robotic Solar Tracking System for Building-Integrated Photovoltaic Applications	9/1/2019 8/31/2021	$231,000.00	$231,000.00
Cao, Yongcan	United States Department of the Air Force - USAF	Optimal 3D Maneuvers for UAV Swarms	2/1/2018 4/30/2020	$200,000.00	$200,000.00
Cao, Yongcan	Department of the Army - DOA	Intelligent Systems (II.A.1.c.i.(4)): Human-guided Online Learning for Long-term Autonomy with Active Self Evaluation	1/1/2021 12/31/2023	$359,897.00	$359,897.00
Cao, Yongcan	National Science Foundation - NSF	REU Site: Artificial Intelligence Powered Robotics in 5G Network	4/1/2021 3/31/2024	$403,354.00	$403,354.00
Cao, Yongcan	Department of the Army - DOA	SHARE: Shared Human-AI-Robot Ecosystem	2/1/2022 1/31/2025	$164,432.00	$164,432.00
Gatsis, Nikolaos	National Science Foundation - NSF	CIF: Small: Integrated Framework for Detection and Mitigation of GPS Spoofing Attacks in Smart Grids	9/1/2017 8/31/2020	$399,934.00	$399,934.00

Gatsis, Nikolaos	National Science Foundation - NSF	Collaborative Research: Cherry-Picking Sensors and Actuators for Topologically Evolving Networked Dynamical Systems: Battling Contamination in Water Networks	9/1/2017 8/31/2020	$299,974.00	$299,974.00
Gatsis, Nikolaos	National Science Foundation - NSF	CAREER: Optimal Interdependent Operation of Electricity Distribution Grids and Water Distribution Systems in Smart Cities	6/1/2019 5/31/2024	$500,000.00	$500,000.00
Gatsis, Nikolaos	Texas A&M University (TAMU)	SRS RN: Sustainable Transportation Electrification for an Equitable and Resilient Society	9/1/2021 8/31/2022	$24,995.00	$24,995.00
Gatsis, Nikolaos	City Public Service	Self-adaptive Protection of Inverter-based Power Systems using Explainable Artificial Intelligence (AI)	3/1/2022 8/31/2023	$400,000.00	$400,000.00
Guo, Ruyan	FBD Partnership LP	Project 2 - Measured Attribute Effect on Drink Properties	9/30/2016 5/15/2017	$36,000.00	$36,000.00
Guo, Ruyan	Boral IP Holdings LLC	Non-Destructive Evaluation Technologies for Product Fabrication and Assessment	9/1/2016 8/31/2017	$25,000.00	$25,000.00
Guo, Ruyan	National Science Foundation - NSF	I-Corps Team: Commercialization feasibility research on CMOS Process Dependent Near-Threshold-Voltage (NTV) Regulation Module	3/15/2017 9/15/2017	$50,000.00	$50,000.00
Guo, Ruyan	National Science Foundation - NSF	Conference Support for the Fourteenth International Meeting on Ferroelectricity	6/1/2017 12/31/2017	$6,000.00	$6,000.00
Guo, Ruyan	City Public Service	A Hybrid Integrated Sensing and Energy Conversion (HISEC) System for Harvesting Mechanical and Thermal Energy from Roadways	9/1/2017 8/31/2019	$596,986.00	$596,986.00
Guo, Ruyan	Boral IP Holdings LLC	Non-Destructive Evaluation Technologies for Product Fabrication and Assessment	4/1/2018 3/31/2019	$36,000.00	$36,000.00

Guo, Ruyan	FBD Partnership LP	Project 3. Deriving Mathematical Models and Feedback Solutions	4/1/2018 12/31/2018	$46,800.00	$46,800.00
Guo, Ruyan	Hall Labs	Additive Manufacturing & Sintering Project	12/3/2018 9/3/2019	$45,000.00	$45,000.00
Guo, Ruyan	National Science Foundation - NSF	IPA Assignment at National Science Foundation	2/19/2019 2/18/2020	$232,142.00	$232,142.00
Guo, Ruyan	National Science Foundation - NSF	IPA Assignment at National Science Foundation, Year 2	3/18/2020 3/17/2021	$237,092.00	$237,092.00
Guo, Ruyan	National Science Foundation - NSF	IPA Assignment at National Science Foundation, Year 3	3/18/2021 3/17/2022	$0.00	$0.00
Guo, Ruyan	Office of Naval Research - Science and Technology	Hybrid Three-Dimensional Deposition and Development (H3D) of Multiferroic Electroceramics for Advanced Nanomaterials-Defined Sensors and Actuators (H3D-MEandSA)	7/1/2021 6/30/2024	$450,000.00	$450,000.00
Guo, Ruyan	University of Texas - Rio Grande Valley	Consortium of Advanced Additive Manufacturing Research and Education for Energy Related Systems (DOE CA2REERs)	9/1/2020 8/31/2024	$1,199,999.00	$1,199,999.00
Jamshidi, Mohammad	Bank of America N.A.	LOITERING ALERT SYSTEM FOR AUTOMATED TELLER MACHINE (ATM) VESTIBULES	7/25/2017 1/25/2018	$131,825.00	$131,825.00
Jamshidi, Mohammad	North Carolina Agricultural & Technical State University	MODELING, ANALYSIS AND CONTROL OF LARGE-SCALE AUTONOMOUS SYSTEM OF VEHICLES	4/8/2015 4/9/2021	$1,208,800.00	$1,208,800.00
Jin, Yufang	Louisiana State University - LSU	TranSET: A multi-AI-agent framework for vehicle-infrastructure integration and electric vehicle robust charging.	4/1/2020 9/30/2021	$40,000.00	$40,000.00
Jin, Yufang	National Science Foundation - NSF	REU Site: Artificial Intelligence Powered Robotics in 5G Network	4/1/2021 3/31/2024	$403,354.00	$403,354.00
Kelley, Brian	Georgia Institute of Technology	Novel Developmental Broadband RF Underwater Communication Techniques In Support Of Heterogeneous	9/1/2016 2/28/2019	$79,961.00	$79,961.00

		Underwater Network Technology			
Kelley, Brian	North Carolina Agricultural & Technical State University	MODELING, ANALYSIS AND CONTROL OF LARGE-SCALE AUTONOMOUS SYSTEM OF VEHICLES	4/8/2015 4/9/2021	$1,208,800.00	$1,208,800.00
Kelley, Brian	Southwest Research Institute	5G Testing, and Verification and Validation	7/1/2020 10/20/2020	$14,999.00	$14,999.00
Kelley, Brian	Radiance Technologies	Principal Investigation of 5G Core & Security and 5G Telemedicine	9/1/2020 9/1/2024	$827,430.00	$827,430.00
Kelley, Brian	National Science Foundation - NSF	REU Site: Artificial Intelligence Powered Robotics in 5G Network	4/1/2021 3/31/2024	$403,354.00	$403,354.00
Kelley, Brian	Radiance Technologies	Principal Investigation of 5G Core & Security and 5G Telemedicine	9/1/2021 5/31/2024	$830,850.00	$830,850.00
Qian, Chunjiang	Qian TelChina	Network Control for Nonlinear Systems in Smart Energy Applications	9/1/2017 8/31/2018	$14,700.00	$14,700.00
Qian, Chunjiang	Arizona State University - ASU	Control Systems Education and Outreach to Low-Income High-School Students in San Antonio	10/1/2017 12/31/2017	$10,000.00	$10,000.00
Qian, Chunjiang	National Science Foundation - NSF	Exploring Multivariant Homogeneity for Behavior Analysis and Controller Design of Nonlinear Dynamical Systems	8/1/2018 7/31/2021	$218,978.00	$218,978.00
Qian, Chunjiang	National Science Foundation - NSF	Data Science Supplement for New Controller Design Approaches for Complex Nonlinear Dynamic Systems	6/1/2020 5/31/2021	$40,466.00	$40,466.00
Qian, Chunjiang	National Science Foundation - NSF	REU Site: Artificial Intelligence Powered Robotics in 5G Network	4/1/2021 3/31/2024	$403,354.00	$403,354.00
Qian, Chunjiang	National Science Foundation - NSF	Collaborative Research: Algebraic Framework of Compositional Functions for New Structure, Training and Explainability of Deep Learning	1/1/2022 12/31/2025	$622,955.00	$622,955.00
Qian, Chunjiang	Google Research	Improving the engagement and self-efficacy of latinx learners	9/30/2021 6/1/2022	$18,000.00	$18,000.00

		through a redesigned entry point ECE course			
Shadaram, Mehdi	Texas Higher Education Coordinating Board	Summer Engineering Camp for high school students	6/1/2017 8/31/2017	$11,727.00	$11,727.00
Walton, Claire	US Nuclear Regulatory Commission - NRC	UTSA Faculty Development in Cybersecurity of Digital I&C in Nuclear Power Plants Research and Education	10/1/2020 9/30/2023	$300,000.00	$300,000.00
Walton, Claire	National Science Foundation - NSF	Collaborative Research: Algebraic Framework of Compositional Functions for New Structure, Training and Explainability of Deep Learning	1/1/2022 12/31/2025	$622,955.00	$622,955.00
Zhang, Jianqiu	National Institute of General Medical Sciences - NIH	SC3: Uncovering the epitranscriptome regulatory codes using machine learning	1/1/2020 12/31/2023	$435,000.00	$435,000.00
Zhang, Jianqiu	National Science Foundation - NSF	REU Site: Artificial Intelligence Powered Robotics in 5G Network	4/1/2021 3/31/2024	$403,354.00	$403,354.00

D. Faculty Professional Development and Curriculum Support

In our department, all faculty are familiar with delivering instruction online. Since mid-March 2020 (beginning of COVID-19 pandemic) the ECE department has been offering the majority of our courses online. The UTSA Faculty Center (https://faculty.utsa.edu/about/) is an important resource for faculty professional development. The Faculty Center provides workshops on Zoom, Teams, Webex, Blackboard, Adobe, assessment strategies, and similar topics throughout the year.

UTSA has invested heavily in the Office of Academic Innovation to support faculty digital learning, technology use, teaching and learning services, video production, online infrastructure, and continuing and professional education. Academic Innovation brings together experts in teaching, technology, and virtual learning to champion innovative and transformational practices that enhance the academic experience for students and faculty. Within Academic Innovation, the Office of Digital Learning manages Blackboard, the university's course management platform, and offers training, resources and course design support to faculty who are looking for ways to engage digitally with students in their traditional classroom, online or hybrid courses. The division of Learning Technologies is dedicated to the successful use of technology in the classroom at UTSA. They provide consultation, design and installation of audio/visual equipment for academic use as well as offer training and support on the use of tech tools and products available to UTSA faculty and staff. UTSA Teaching and Learning Services offers programs, services and resources to faculty that support instructional excellence, innovative teaching, and outstanding educational experiences. he UTSA Video Production and Technology team works with faculty and staff to develop and produce professional quality instructional and informational videos geared to students. In addition, they provide the university's official web-streaming services.

IV. Resources

A. Student Financial Assistance

The ECE Department will financially assist all full-time CE PhD program students through Graduate Research Assistantships (GRAs), Graduate Teaching Assistantships (GTAs) and Scholarships. Research funds available for CE PhD student GRA support are estimated to be 10% of total annual research expenditures of the ECE Department, which is approximately $5 million per year. Additional support will be provided in the form of GTAs and Scholarships. UTSA's CEID administers dozens of graduate student scholarships including the $7,500 Valero Scholarship. More detail on CEID scholarships is available here: http://engineering2.utsa.edu/index.php/graduatestudies/scholarships/. The details of the student financial assistance available to students are given in Table 18. Thus, the combined budget is sufficient to support the projected number of full-time enrollees to the proposed CE PhD program.

Table 18. Student Financial Assistance

	Year 1	Year 2	Year 3	Year 4	Year 5

Teaching Assistantships	# of Full-time students	9	9	9	9	9
	Amount per student	$17.5k	$17.5k	$17.5k	$17.5k	$17.5k
	# of Part-time students	1	1	1	1	1
	Amount per student	$17.5k	$17.5k	$17.5k	$17.5k	$17.5k
Research Assistantships	# of Full-time students	15	15	15	15	15
	Amount per student	$30k	$30k	$30k	$30k	$30k
	# of Part-time students	3	3	3	3	3
	Amount per student	$10k	$10k	$10k	$10k	$10k
Scholarships/ Stipends	# of Full-time students	17	17	17	17	17
	Amount per student	$12k	$12k	$12k	$12k	$12k
	# of Part-time students	6	6	6	6	6
	Amount per student	$7k	$7k	$7k	$7k	$7k

B. Library Resources

Recently, UTSA has made significant progress in improving library collections, facilities, and services to support Tier 1 status. The library holds over 3.6 million print and online monographic volumes, over 87,000 serials, and nearly 50,000 audiovisual items. The large government documents collection includes a complete depository for Texas state documents and a selective Federal Document Depository. The library provides access to a robust collection of nearly 500 online databases.

The UTSA libraries purchase materials to support bachelor's, master's, and doctoral programs in Science and Engineering, and has done so since the inception of those degree programs. The library has purchased materials to support a variety of existing degree programs at UTSA, including programs in Chemical Engineering, Environmental Science, Chemistry, and Geological Sciences in the College of science, programs in Environmental Engineering, Industrial Engineering, Sustainable Energy, Materials Engineering, Electrical Engineering, Biomedical Engineering, and Mechanical Engineering. Library materials purchased for the above programs provide additional direct and indirect support to Computer Engineering. The Library Report provided by Posie Aagaard, Assistant Dean for Collections and Curriculum Support, in support of the proposed program is included in Appendix E.

C. Facilities and Equipment

THE ECE Department has very modern office, laboratory and classroom facilities. In 2006, the administrative and faculty offices were moved from the Engineering Building (EB) to the new

Biotechnology Science and Engineering (BSE). Additional office, laboratory and classroom facilities were allocated to the ECE Department in 2010, when the new Applied Engineering Technology (AET) building was opened.

The ECE Department has all the laboratory, classroom and research facilities needed for the proposed PhD program in Computer Engineering. The major ECE Department laboratory and research facilities including software and equipment that are available for computer engineering PhD program are listed below:

Electronic Design Automation (EDA) Software: The ECE department has the following EDA tools available for research and teaching.

- Cadence
- Synopsys
- Siemens EDA (Formerly Mentor Graphics)

These software tools provide a complete integrated circuit (IC) design flow that includes simulation, emulation, place and route, verification, design for manufacturing, and test. They are also used for circuit design, circuit simulation, layout design, layout verification, and library characterization.

Computer Architecture: The following software tools for computer architecture simulation and performance analysis are available for research and teaching.

• Gem5	Architectural simulator
• ModelSim	Functional Simulator
• Keil uVision5	Instruction set simulation
• McPAT	Integrated power area and timing simulation tool
• Wattch	Architectural Level Power estimation tool
• Hotleakage	Architectural Level Leakage estimation tool
• Simplescalar	Architecture Simulator
• CACTI etc.	Cache Simulator
• SPEC Benchmarks	Performance Evaluation

FPGA Development Boards: The ECE department has several Field Programmable Arrays (FPGAs) development boards for prototyping. The department has FPGA boards from Intel (previously Altera) and AMD (previously Xilinx). These boards also include the donations the department received from Intel Corporation.

AI/Machine Learning: The ECE department has several servers and hardware platforms (for example Nvidia servers) for AI/Machine learning related research and teaching. In addition, the department has several machine learning opensource development platforms such as Tensor Flow and PyTorch and have access to large data base for training the machine learning networks. Several ECE faculty are part of the UTSA AI Consortium and the director of the consortium, Dr. Dhireesha Kudithipudi, is a ECE faculty.

PCs and Workstations: The department has a large number of PCs and workstations and they are housed in several labs spread across several building on campus. The students can access all the department software and applications through these machines. The

students can also access these software and applications off-campus through the university provided secure connections. A sample of the machines available in these labs are listed below.

- Desktop CPU: Dell Optiplex 9010 Aio EPA Non-Touch with Camera
- Desktop CPU: Apple IMAC with Display
- Desktop CPU: Lambda System
- Desktop CPU: Dell Precision T5500 Workstation
- Desktop CPU: Apple IMAC 27
- Desktop CPU: Optiplex 7450
- Server: Poweredge R940
- Desktop CPU: Alienware R8
- CPU Desktop Apple: Apple IMAC 21.5-Inch Intel Core 2 Duo Comp
- CPU Desktop Apple: Apple Mac Mini 2.3ghz Dual-Core Intel Core
- Desktop CPU: Lambda Quad Operating System
- Desktop CPU: Lambda Workstation
- Desktop CPU: Dell Optiplex Gx620 Mt With Int Broadcom GBNIC I
- Desktop CPU: Dell Optiplex 7010 Minitower Computer
- Desktop CPU: Dell Precision T1600 Computer
- Server: Sirius Computer Express X3550 M3 Mini Cloud Server
- Server: Lambda Quad
- Projector: Epson Ex9240
- Portable CPU: Dell Latitude D630 Intel Core 2 Duo T7250
- Desktop CPU: Dell Precision T5500n Computer
- Portable Apple CPU: Apple Macbook Pro 13 Laptop
- Desktop CPU: Dell Prec T5500n CMT Processor Computer

Cloud Computing: Faculty and students will have access to the facilities at UTSA's Open Cloud Institute (OCI). OCI has the following research labs:

- Cloud Lab for Engineering Application Research (CLEAR)
- Internet Of Things (IOT) Lab
- Secure AI & Big Data Lab

The director of the OCI, Dr. Jeff Prevost, is an ECE faculty.

UTSA Cloud Platforms include the following.

- Collapsed Network Aggregation Architecture for Layer 2 and Layer 3 optimization and flexibility
- Redundant Juniper EX4200 Switch pairs capable of 128Gb of backplane throughput on each switch and port virtualization to provide for up to 480 ports per switch pair
- Up to 10Gb of network throughput throughout
- Dell PowerEdge R710 Servers with (6) 3.5" 2TB drives with RAID 5
- Total Local Storage: 312 Terabytes
- Total Cores: 312 Westmere
- Windows and Linux Hybrid-Capable Environment

IoT and Security: The equipment and devices available for IoT and Security are listed below.

- One Lambda Blade 6*A100 GPU server
- Processor: 2x AMD EPYC 7302: 16 cores, 3.0 GHz, 128 MB cache, PCIe 4.0
- GPUs: 6x NVIDIA Tesla A100 (PCIe), 40 GB of VRAM per GPU
- Memory: 512 GB
- Operating system drive: 3.84 TB SSD (NVMe)
- Extra Storage: 3.84 TB SSD (SATA)
- One DELL PowerEdge R930 Server (32 core)
- One HPE ProLiant Gen 9 server and 1TB storage
- Switch and Routers
- Ten desktops (PC and iMac) and laptops (MacBook and Surface) computers.
- Elasticsearch, Kibana, and other software
- IoT sensors and devices
- Testing tools and equipment
- Pico 6404E - Ultra-Deep-Memory Oscilloscope, 500MHz, 4 Channel, 8-bit
- Tektronix oscilloscope; Digital Phosphor, 70 MHz, 1 GS/s, 1M record length, 2ch, Color Display
- Rockwell Automation Enterprise and Student Toolkits 26 copies (valid until 2027)

Network and Information Security and Privacy (NISP): The equipment and devices available for NISP are listed below.

- Four Lambda Quad server with 3.00 GHz 18-core, 256GB Memory, 2 TB NVMe SSD, and 4 Quadro RTX 8000 GPU with NVLink, and one Lambda Quad server with 3.30 GHz 10-core, 64GB Memory, 2TB NVMe SSD, and 4 RTX 2080 Ti GPU
- One NVIDIA DGX workstation
- Ten CanaKit Raspberry Pi 4 Kit, and 10 Raspberry Pi Camera Module
- Two Jetson TX2 Developer Kit
- Self-driving small-scale cars
- Two DJI RoboMaster S1, two Parrot Bebop Quadcopter Drone, and One Virtual Reality
- Headset Oculus Go
- Three Mac laptops for outdoor experiments and demonstration
- Ten workstations with GPUs and MATLAB/Simulink, IBM ILOG CPLEX, GUROBI, and ns-3 installed
- Two Android smartphones and two iPads
- Two National Instruments USRP N200 Kit
- Two HackRF One SDR bundle
- One OpenFlow Switch Pronto 3290
- Four TP-Link TL-WR103ND wireless routers with SDN capability

High Performance Computing: Faculty and students in the computer engineering PhD program will have access to Arc. Arc is one of UTSA's high performance computational clusters and is maintained by UTS (Tech Solutions) Research Computing Support Group (RCSG). RCSG provides performance solutions to Arc that includes:

- Supporting hardware, operating system, and applications
- Troubleshooting performance issues, system errors, etc

Texas Advanced Computing Center (TACC): The E have access to TACC. The Texas Advanced Computing Center (TACC, http://www.tacc.utexas.edu) at UT Austin develops and deploys an integrated infrastructure of advanced computing resources to enhance the research and education activities of the faculty, staff, and students at UT Austin, University of Texas System institutions (including UT San Antonio), in Texas and across the US though its involvement in various state and national programs. This infrastructure includes high performance computing (HPC) systems, advanced scientific visualization (SciVis) systems, data servers and storage/archival systems, grid computing servers, IT systems, high-bandwidth networks, and a comprehensive software environment comprising applications, tools, libraries, databases, and grid software. TACC services include technical documentation, consulting, and training in HPC, SciVis, and grid computing.

Among many others, TACC houses Stampede2, one of the most powerful machines in the world for open science research. Funded by NSF and built in partnership with Intel, Dell and Seagate. Stampede2 went into production on July 28, 2017 and entered full production in Fall 2017. Stampede2 provides 18PFLOPS at full speed. The bulk of the cluster consists of 4,200 Intel Xeon Phi/Knights Landing (KNL) nodes, the second generation of processors based on Intel's Many Integrated Core (MIC) architecture, each with 68 cores, 96GB of DDR RAM, and 16GB of high speed MCDRAM, as well as 1,736 Intel Xeon Skylake nodes. In addition, the cluster comprises a 100 Gb/sec Intel Omni-Path network with a fat tree topology employing six core switches and two dedicated high performance Lustre file systems with a storage capacity of 31PB. Furthermore, TACC has two primary data/storage systems in addition to direct-attached storage on each system: an Oracle Storage Area Network (SAN) and an archival storage system. The SAN is currently installed at approximately 54 TB. TACC's primary archival storage system is an Oracle StorageTek SL8500 tape library with 10,000 slot capacity utilizing STK T10000 tape technology, with a maximum capacity of 10 PB and a current capacity of 2 PB.

D. Support Staff

We do not anticipate any immediate needs for additional support staff. The staff who is currently handling the PhD in Electrical Engineering program with Computer Engineering concentration will handle the new PhD in Computer Engineering program. Also, there is no need to have a new Graduate Advisor of Record (GAR). Since initially the number of enrolled students will be the same, the ECE Department GAR will also serve as GAR for the new PhD in Computer Engineering program.

E. External Learning

NOT APPLICABLE

F. List of Potential Expert External Reviewers

Table 19. Institution's Proposed Expert External Reviewers

Reviewer #1

Name	Dr. David Kaeli
Title and Rank	COE Distinguished Professor, Dept. of Electrical and Computer Engineering
Institution	Northeastern University
Phone #	(617) 373-5413
Email	kaeli@ece.neu.edu
Qualifications/Expertise	Dr. Kaeli is the Director of the Northeastern University Computer Architecture Research Laboratory (NUCAR). He served as a Research Thrust Leader for the NSF Center for Subsurface Sensing and Imaging Systems (CenSSIS). He is a member of the Northeastern University Institute for Information Assurance (IIA). He is also a member of the Northeastern University Institute for Complex Scientific Software (ICSS). Prof. Kaeli is a Fellow of the IEEE and a Distinguished Scientist of the ACM. He presently serves as the Editor-in-Chief of ACM Transactions on Computer Architecture and Code Optimization. He serves as an elected member of the IEEE Technical Committee on Computer Architecture. He also serves as an Associate Editor for IEEE Transactions on Parallel and Distributed Systems and the Elsevier Journal of Parallel and Distributed Computing. Previously, he has served as an Associate Editor for IEEE Transactions on Computers and IEEE Computer Architecture Letters.
Reviewer #2	
Name	Dr. Karen Panetta
Title and Rank	Professor, Electrical and Computer Engineering and Dean of Graduate Education for the School of Engineering
Institution	Tufts University
Phone #	(617) 627-5976
Email	karen.panetta@tufts.edu
Qualifications/Expertise	Dr. Panetta is an IEEE Fellow, NASA JOVE Fellow and AAIA Fellow. Her expertise includes Artificial Intelligence, Machine Learning, automated systems, simulation and visual sensing systems. She develops signal and imaging processing algorithms, simulation tools and embedded systems for applications for robot vision and biomedical imaging applications. She has won a number of awards for excellence in research, social impact, teaching and mentoring, ethics, and engineering education. She is the recipient of the Presidential Award for Excellence in Science, Math and Engineering Mentoring from U.S. President Barack Obama.
Reviewer #3	
Name	Dr. Vijaykrishnan Narayanan
Title and Rank	A. Robert Noll Chair Professor of Computer Science & Engineering and Electrical Engineering.
Institution	Penn State University
Phone #	814-863-0392
Email	vijay@cse.psu.edu
Qualifications/Expertise	Dr. Narayanan is a Fellow of the National Academy of Inventors, IEEE and ACM. His expertise is in Power Aware Computing, Computer Architecture, Integrated Circuits and Systems; Operating Systems, Cloud Computing, Embedded Systems and Design Automation of Electronic Systems. He is a co-director of the Microsystems Design Lab.
Reviewer #4	
Name	Dr. James C Hoe
Title and Rank	Professor of Electrical and Computer Engineering

Institution	Carnegie Mellon University
Phone #	412-268-4259
Email	jhoe@cmu.edu
Qualifications/Expertise	Dr. Hoe is a Fellow of IEEE. His expertise is in the areas of many aspects of computer architecture and digital hardware design, including the specific areas of FPGA architecture for computing; digital signal processing hardware; and high-level hardware design and synthesis.
Reviewer #5	
Name	Dr. Hyesoon Kim
Title and Rank	Professor, College of Computing, School of Computer Science.
Institution	Georgia Tech
Phone #	(404) 385-3303
Email	hyesoon@cc.gatech.edu
Qualifications/Expertise	Dr. Kim's expertise is in Compiler and hardware support for heterogeneous (GPU/CPU) architectures, Computer architecture, compiler-microarchitecture interaction, Low-power high-performance embedded processors, especially for automotive systems, Compiler and hardware support for dynamic optimizations, virtual machines, and binary instrumentation.
Reviewer #6	
Name	Dr. Viktor K. Prasanna
Title and Rank	Professor of Electrical Engineering and Professor of Computer Science
Institution	University of Southern California
Phone #	(213) 740-4483
Email	prasanna@usc.edu
Qualifications/Expertise	Dr. Prasanna is a Fellow of the IEEE, the Association for Computing Machinery (ACM) and the American Association for Advancement of Science (AAAS). His expertise includes High-Performance Computing, Parallel and Distributed Systems, Reconfigurable Computing, Cloud Computing, and Smart Energy Systems.

G. Five-Year Costs and Funding Sources Summary

An extensive overview of new and reallocated costs for the proposed program is provided below. This summary was evaluated using the funding tool developed by Paul Turcotte, a former member of the Coordinating Board.

Costs to the Institution of the Proposed Program

Cost Category	Cost Sub-Category	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTALS
Faculty Salaries[1]	**New**	0	0	0	0	0	0
	Reallocated	783,568	783,568	783,568	783,568	783,568	3,917,839
Program Administration	**New**	0	0	0	0	0	0
	Reallocated	10,000	5,000	5,000	5,000	5,000	30,000
Graduate Assistants	**New**	60,000	60,000	60,000	60,000	60,000	300,000
	Reallocated	0	0	0	0	0	0
Clerical/Staff	**New**	0	0	0	0	0	0
	Reallocated	15,000	15,000	15,000	15,000	15,000	75,000
Student Support (Scholarships)		0	0	0	0	0	0
Supplies and Materials		5,000	5,000	5,000	5,000	5,000	25,000
Library & Instructional Technology Resources[2]		0	0	0	0	0	0
Equipment[2]		0	0	0	0	0	0
Facilities		0	0	0	0	0	0
Other (Identify)=start up for faculty		400,000	200,000	200,000	200,000	0	1,000,000
TOTALS		1,273,568	1,068,568	1,068,568	1,068,568	868,568	5,347,839

[1]Report costs for new faculty hires, graduate assistants, and technical support personnel. For new faculty, prorate individual salaries as a percentage of the time assigned to the program. If existing faculty will contribute to program, include costs necessary to maintain existing programs (e.g., cost of adjunct to cover courses previously taught by faculty who would teach in new program).

2Equipment has the meaning established in the Texas Administrative Code §252.7(3) as items and components whose cost are over $5,000 and have a useful life of at least one year.

Anticipated Sources of Funding

Funding Category	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTALS
I. Formula Funding[1]			906,982	929,985	943,130	$2,780,097
II. Other State Funding	0	0	0	0	0	0
III. Reallocation of Existing Resources	783,568	783,568	783,568	783,568	783,568	3,917,839
IV. Federal Funding (In-hand only)	0	0	0	0	0	0
V. Tuition and Fees	517,114	1,234,825	1,266,963	1,299,100	1,317,629	5,635,632
VI. Other Funding[2]	0	0	0	0	0	0
TOTALS	1,300,682	2,018,393	2,957,513	3,012,653		12,333,568

[1]Indicate formula funding for students new to the institution because of the program; formula funding should be included only for years three through five of the programs and should reflect enrollment projections for years three through five.

[2]Report other sources of funding here. In-hand grants, "likely" future grants, and special item funding can be included.

Non-Formula Sources of Funding

Complete the table to specify each of the non-formula funding sources for the amounts listed on the Anticipated Sources of Funding form.

Funding Category	Non-Formula Funding Sources
II. Other State Funding	N/A
III. Reallocation of Existing Resources	#1 Faculty salaries
	#2 Staff salaries
IV. Federal Funding (In-hand only)	N/A
V. Tuition and Fees	#1 Based on student enrollment projections
VI. Other Funding	

H. Signature Page

The appropriate signature page must be selected and signed by the required institutional official and board of regents.

V. Additional Distance Education Delivery Consideration

Not Applicable

VI. Required Appendices