

GAANN Fellowships in EECE - “Smart Sensor Systems”

The primary goal of the Marquette University, Department of Electrical and Computer Engineering, GAANN¹ Fellowship program in Smart Sensor Systems is to increase the number of individuals prepared for and motivated to pursue a career in teaching and research at the university level in electrical engineering with a speciality in Smart Sensor Systems. The Smart Sensor Systems area embraces many diverse efforts including fundamental research into materials, communication and coordination among sensors in networks to provide meaningful information, and using sensor information to control other processes. Sensors and sensor systems are areas specifically identified by the National Science Foundation (NSF) as being ones in which the research strength in US universities will directly impart the United States’ technology competitiveness and even national security now and in the future.

Students seeking to be funded through the MU-EECE-GAANN fellowships must meet certain program criteria which are described here.

Before acceptance as a GAANN scholar, students must declare in writing that they

- (1) are committed to completing a Ph.D. in Electrical Engineering with an emphasis in Smart Sensor Systems,
- (2) are planning to pursue a career in university teaching and research,
- (3) are eligible to receive (financial) assistance under 34 CFR 75.60, and
- (4) agree to provide the department with their current contact information for a period of 10 years after completing or leaving the GAANN program for the purposes of program assessment.

In addition, students must provide evidence of U.S. citizenship or permanent residence in the U.S., or permanent residence in the Trust Territories of the Pacific Islands and complete the Free Application for Federal Student Aid (FAFSA) form.

While a GAANN scholar, students will prepare for their future as university faculty with training and **experience in the three “cornerstones” of an academic career - research, teaching and service.**

Research training for GAANN scholars is obtained through the rigors of the education leading to the Ph.D. degree. The educational requirements for GAANN scholars include those typically required of all Ph.D. candidates: successful completion of required course work, elective course work, the written and oral Ph.D. qualifying exams, the necessary original research leading to a dissertation, as well as the public defense of that dissertation.

¹ The Graduate Assistantships in Areas of National Need (GAANN) Program is funded by the Department of Education.

The academic course work expected of all GAANN scholars is listed below. Note that the courses listed below may have prerequisites that will require additional courses beyond those required. Unless otherwise noted, all courses carry three credit hours.

(A) **Required courses (18 credit hours)**

- General EECE courses (6 credits)
 - EECE 205 Advanced Engineering Mathematics
 - EECE 206 Probability and Random Processes in Engineering

(Students who have already completed one or both course as part of the M.S. degree program, will substitute two other advanced electives).
- Sensors courses (6 credits)
 - EECE 263 Infrared/Photonics Sensors
 - EECE 264 Microelectromechanical Systems and Sensors
- Signal Processing and Control (6 credits)
 - EECE 212 Pattern Recognition
 - EECE 220 Modern Control Theory

In addition, all GAANN scholars will enroll in EECE 297 “Department Seminar” (0 credit) each semester.

(B) **Elective Courses (minimum of 12 credits)**

- Electives in Signal Processing and Control
 - EECE 222 Optimal and Adaptive Digital Signal Processing
 - EECE 225 Optimal Control
 - EECE 227 Nonlinear and Adaptive Control
- Electives in Pattern Recognition
 - EECE 211 Algorithm Analysis and Applications
 - EECE 215 Neural Networks and Neural Computing
- Electives in Sensors, Device Physics and Electromagnetics
 - EECE 201 Advanced Electromagnetic Fields
 - EECE 202 Electromagnetic Theory
 - EECE 261 Surface Acoustic Wave Devices
- Other Relevant Electives*
 - EECE 151 Topics in Computer and Control
 - EECE 176 Sensors Devices: Theory, Design and Applications
 - EECE 229 Estimation and Stochastic Control
 - BIEN 240 Biomedical Instrumentation
 - BIEN 241 Microprocessor Based Electrical/Biomedical Instrumentation
 - BIEN 242 Radio Frequency Applications in Electrical/Biomedical Engineering
 - CEEN 154 Environmental Chemistry
 - CEEN 242 Biochemical Transformations in the Environment
 - CHEM 160 Introduction to Polymer Science
 - CHEM 263 Introduction to Spectroscopy

*(*Other graduate electives may be added to this list by the project directors as new courses are added to the curriculum. Other electives not on this list but part of a planned research program may be approved on an individual basis by the project directors.)*

(C) **Dissertation Credit (12 credit hours), EECE 399 - Doctoral Dissertation**

Course work is only a portion of the research preparation expected of Ph.D. candidates. Other GAANN requirements include the following.

- GAANN scholars must select their research area and advisor within the first semester of their program after which time they are required to actively participate in the research seminars associated with their chosen area by enrolling in the appropriate EECE 396 each semester.
- In addition, GAANN scholars are expected to regularly share the results of their research, in their seminars, as well as through presentations and publications. Specifically, GAANN scholars are expected to
 - prepare a technical abstract and associated poster display for the annual Sigma Xi Student Poster Symposium at Marquette University in their second year as a GAANN scholar,
 - present one or more conference papers by the fifth regular semester in collaboration with their research advisor, and
 - submit one or more journal articles, co-authored with their advisor by the sixth regular semester.
- In their second year, GAANN scholars will also write a formal proposal with budget requesting expense funds for their third year research efforts, including travel to professional or educational conferences.

It is fully expected that GAANN scholars should be able to complete all requirements for the Ph.D. and successfully defend the dissertation by the conclusion of their third year as a GAANN scholar.

Teaching experience for GAANN scholars will, as for the research experience, be obtained through a combination of theory (course work) and practice.

All GAANN scholars are expected to enroll in the weekly (one-credit per semester) seminar, EECE 396 “Academic Careers” every regular semester of their GAANN program. The seminar will be run by the Project Directors and will primarily focus on educating engineers. However, GAANN scholars will also hone their “job search” skills by developing written statements of their teaching and research philosophies as well as their “interview seminar”, the presentation of which will be focus of a “mock interview” with department faculty.

The formal teaching experience of the GAANN scholars will start in their first year, during which time the student will serve as a half-time teaching assistant for both semesters with grading responsibility associated with one of the electrical engineering laboratories or classes being offered. Prior to the second year, the GAANN fellow, in consultation with their research advisor and the project directors, will select a course for which they will have the primary teaching responsibility during their third year. During the second year, the GAANN scholar will serve a “teaching apprenticeship” as the half-time teaching assistant for that course for one semester, to not only observe day-to-day course management and instruction, but also to work collaboratively with their faculty mentor to develop curriculum materials to support pedagogy for the course - materials which they themselves will be using when, in the third year, they assume full responsibility for the class. During the third year, the faculty mentor will continue to work with the GAANN scholar to provide support, guidance, and advice by reviewing both class materials and classroom performance. The faculty mentor will visit the class bi-weekly followed with a review of that class with the scholar. In addition, GAANN scholars are expected to attend at least one engineering education conference, such as a regional or national

meeting of the ASEE.

The service aspect of an academic life will also be experienced by GAANN scholars. All GAANN scholars are required to become student members of the Institute for Electrical and Electronic Engineers (IEEE) as well as the American Association for Engineering Education (ASEE). In addition to these memberships in the primary societies of the electrical engineering academic community, each scholar is also expected to perform some type of service to the profession. This service will be chosen by the fellow, subject to approval by the Project Directors, and may include serving on an all-university committee which has graduate student members (such as the Academic Senate), on the department's Graduate Student Advisory Board, or as a co-advisor of one of the student societies in the department, such as the IEEE student chapter or the HKN chapter. The GAANN scholar's service experiences will be periodically discussed during the Academic Careers Seminar.

Support

GAANN scholars are eligible to receive the following support.

- A graduate stipend to meet the scholar's need as determined by the Department of Education up to a maximum of \$30,000 per year. GAANN scholars are required to submit the Free Application for Federal Student Aid (FAFSA) no later than March 1 in order to determine financial need for the subsequent academic year.
- Tuition support up to a maximum of 18 credits per academic year.

Note: stipend and tuition support not used by an individual GAANN scholar are used to support the stipends and or tuition of additional GAANN scholars.

Questions?

For further information, contact any of the MU-EECE-GAANN Program Project Directors:

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