OLD DOMINION UNIVERSITY

TO: Members of the Academic and Research Advancement Committee of the Board of Visitors

Toykea S. Jones, Chair
Brian K. Holland, Vice Chair
R, Bruce Bradley, *(ex-officio)*
P. Murry Pitts *(ex-officio)*
Dennis M. Ellmer
Juan M. Montero, II
Rick Wyatt
David Burdige *(Faculty Representative)*

FROM: Augustine O. Agho
Provost

Kenneth Fridley
Vice President for Research

DATE: April 10, 2024

The purpose of this memorandum is to provide you with background information for our meeting on Thursday, April 18, 2024. The meeting will be held in the Board Room of the Kate and John R. Broderick Dining Commons from 11:15 a.m. – 12:45 p.m.

I. Approval of Minutes of the November 30, 2023, Meeting

The minutes of the November 30, 2023, meeting will be presented for approval as previously distributed.

II. Motion to go into Closed Session

III. Closed Session

The members of the Academic and Research Advancement Committee will receive information related to the items to be discussed in closed session.

Old Dominion University is an equal opportunity, affirmative action institution. Minorities, women, veterans and individuals with disabilities are strongly encouraged to apply.

IV. Reconvene in Open Session

V. FOIA Certification Motion and Roll-Call Vote on Motion

VI. Motion and Vote on Closed Session Resolutions

VII. Consent Agenda

Included in the consent agenda materials are resolutions recommending 27 faculty appointments. and 14 emeriti appointments.

VIII. Motion and Vote on Consent Agenda Resolutions

IX. Regular Agenda

Included in the regular agenda materials are a proposal for a Ph.D. in Electrical and Computer Engineering, a proposal for an M.S. in Electrical and Computer Engineering, the recommended closure of the BSED program in Early Childhood Education and a program modification request for the Master of Business Administration (MBA) to become a 30 credit-hour program.

X. Motion and Vote on Regular Agenda Items

XI. Information Items

The report from the Provost will include four departmental name changes approved by SCHEV.

The report from the Vice President for Research will include a presentation by David Flanagan, Assistant Vice President for Research Security and Export Control, and Shannon Robinson, Associate Vice President for Research and Executive Director of the ODU Research Foundation on the increasing complexity of federal research compliance regulations.

C: President Brian O. Hemphill
Ashley Schumaker
Donna Meeks

OLD DOMINION UNIVERSITY
BOARD OF VISITORS
ACADEMIC AND RESEARCH ADVANCEMENT COMMITTEE
APRIL 18, 2024
AGENDA

I. CALL TO ORDER

II. APPROVAL OF THE MINUTES OF NOVEMBER 30, 2023

III. MOTION TO GO INTO CLOSED SESSION

IV. CLOSED SESSION AGENDA

V. RECONVENE IN OPEN SESSION

VI. FOIA CERTIFICATION MOTION AND ROLL-CALL VOTE ON MOTION

VII. MOTION AND VOTE ON CLOSED SESSION RESOLUTIONS

VIII. CONSENT AGENDA
- A. Faculty Appointments
- B. Emeritus/Emerita Appointments

IX. MOTION AND VOTE ON CONSENT AGENDA RESOLUTIONS

X. REGULAR AGENDA
- A. Proposed PhD in Electrical and Computer Engineering
- B. Proposed MS in Electrical and Computer Engineering
- C. Closure of BSED in Early Childhood Education
- D. Master of Business Administration Program modification request

XI. MOTION AND VOTE ON REGULAR AGENDA RESOLUTIONS

XII. INFORMATION ITEMS

A. Report from the Provost - Departmental name changes approved by SCHEV
1. Department of Educational Foundations and Department of Leadership to Educational Leadership and Workforce Development
2. Department of Human Movement Sciences to Department of Human Movement Studies and Special Education
3. The School of Kinesiology and Health Sciences will now be the School of Exercise Science
4. The School of Communication Sciences and Disorders will now be the School of Speech-Language Pathology.

B. Report from the Vice President for Research will include a presentation by David Flanagan, Assistant Vice President for Research Security and Export Control, and Shannon Robinson, Associate Vice President for Research and Executive Director of the ODU Research Foundation on the increasing complexity of federal research compliance regulations.

April 18, 2024

FACULTY APPOINTMENTS

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the following faculty appointments.

Name and Rank	Salary	Effective Date	Term
Abdellatif Ait Lahcen Post-Doctoral Research Associate Center for Bioelectronics Restricted	$45,000	3/10/24	12 Mos

Dr. Ait Lahcen received a Ph.D. in Analytical Chemistry, Faculty of Science and Techniques, and an M.Sc. in Chemistry both from Hassan II University of Casablanca, Morocco. He also received a B.Sc. in Chemistry from the University of Ibn Zohr-Agadir, Morocco. Previously he was a Postdoctoral Associate in the Department of Radiology at the Dalio Institute of Cardiovascular Imaging, Weill Cornell Medicine, New York. (Appointment is contingent upon successful work authorization)

Suhas S. Akunte Lecturer Department of Engineering Technology Restricted	$75,600	12/25/23	12 Mos

Dr. Akunte received a Ph.D. in Mechanical Engineering from Tennessee Technological University, an M.S.in Design Engineering from the NBN Sinhgad School of Engineering, Pune, India, and a B.S. in Mechanical Engineering from the Maharashtra College of Engineering, Latur, India. Previously he was a Graduate Research Assistant at Tennessee Technological University. (Appointment is contingent upon successful work authorization)

Travis T. Alexander Assistant Professor Department of English Tenure Track	$77,000	7/25/24	10 Mos

Dr. Alexander received a Ph.D. in English & Comparative Literature from the University of North Carolina at Chapel Hill and a B.A. from the University of Texas at Austin. Previously he was a Lecturer in Medical Humanities at Rice University.

Isabel L. Ariagada $76,000 7/25/24 10 Mos
Assistant Professor
Department of Sociology & Criminal Justice
Tenure Track

Ms. Arigada received a J.D. from Universidad de Chile, Santiago, Chile, an M.A. in Sociology from the Universidad Católica de Chile, Santiago, Chile, and an M.A. in Sociology from the University of Minnesota. She is expected to receive a Ph.D. in Sociology from the University of Minnesota. Previously she was an Instructor at the University of Minnesota in the Department of Sociology. (Appointment is contingent upon successful work authorization; Rank is contingent upon successful completion of Ph.D. requirements by July 25,2024)

Joel L. Bock $56,250 7/25/24 10 Mos
Lecturer
Department of Philosophy & Religious Studies

Mr. Bock received an M.A. in Philosophy from DePaul University, an M.A. in German Studies from Middlebury College, and a B.A. in Philosophy from Colorado College. He is expected to receive a Ph.D. in Philosophy from DePaul University. Previously he taught multiple classes in the Philosophy Department at DePaul University. (Rank is contingent upon successful completion of Ph.D. requirements by July 25, 2024)

Dr. Chen Chen $90,000 12/25/23 12 Mos
Lecturer
Department of Finance
Restricted

Dr. Chen received a Ph.D. in Business Administration from Old Dominion University, an M.S. in Quantitative Finance from Hofstra University and a B.S. in Finance from Shanghai University of International Business and Economics, Shanghai, China. Previously he was an Instructor at Old Dominion University in the Department of Finance. (Appointment is contingent upon successful work authorization)

Julaine S. Clunis $73,000 7/25/24 10 Mos
Assistant Professor
Department of STEM Education & Professional Studies
Tenure Track

Dr. Clunis received a Ph.D. in Communication and Information, an M.S. in Information Architecture & Knowledge Management, and a Master of Library and Information Sciences from Kent State University. She also received a B.Sc. in Information Science from Northern Caribbean University. Previously she was a Visiting Professor in the School of Information Studies at the University of Wisconsin – Milwaukee. (Appointment is contingent upon successful work authorization)

Kristie L. Escobar $60,180 7/25/24 10 Mos
Lecturer
STEM Education & Professional Studies

Dr. Escobar received a Ph.D. in Information Sciences and a Master of Library and Information Sciences from The Florida State University, an M.A. in Humanities from Tiffin University, and a B.A. in Linguistics from the University of Florida. Previously she was a Visiting Lecturer and an Adjunct Assistant Professor in the Department of STEM Education & Professional Studies at Old Dominion University.

Mahmud Hasan $86,700 6/10/24 12 Mos
Lecturer
School of Interdisciplinary Studies

Dr. Hasan received a Ph.D. in Computational Modeling and Simulation Engineering from Old Dominion University. He also received an M.S. and B.S. in Applied Physics, Electronics and Communication Engineering from the University of Dhaka, Bangladesh, India. Previously he was an Emergency Hire Lecturer in Game Development & Game Programming at Old Dominion University.

Rajendran Jegan $45,000 4/25/24 12 Mos
Post-Doctoral Research Associate
Center for Bioelectronics
Restricted

Dr. Jegan received a Ph.D. from Anna University, Tamul Nadu, India an M. Tech in Embedded Systems from Karunya University, Tamul Nadu, India and a Bachelor of Engineering in Electrical and Computer Engineering from Anna University, India. Previously, he was a Post-Doctoral Research Assistant in the School of Engineering at Purdue University. (Appointment is contingent upon successful work authorization.)

Carrie A John $195,000 12/10/23 12 Mos
Associate Vice Provost & University Registrar
University Registrar
Academic Affairs

Ms. John received an M.A. in Student Affairs in Higher Education from Indiana University of Pennsylvania and a B.S. in Accounting from Pennsylvania State University. Previously she was the Associate Vice Chancellor for Enrollment Operations and Assistant Vice Chancellor for Data Quality, Analytics, and Governance and the University of Colorado Denver, Anschutz Medical Campus.

Amber K. Keesee $58,000 7/25/24 10 Mos
Lecturer
Department of Teaching & Learning

Dr. Keesee received an Ed.D. and Ed.S. in Curriculum and Instruction and an MAT in Elementary Education K-6 from Liberty University. She also received a B.S. in Psychology from Virginia Tech. Previously she was a School Testing Coordinator, an Elementary and Middle School Teacher, and a Gifted Math Teacher in the Isle of Wight County Schools in Smithfield, VA.

Hansol Lee $135,000 7/25/24 10 Mos
Assistant Professor
Department of Information Technology & Decision Sciences
Tenure Track

Ms. Lee received an M.B.A. and a B.A.in Economics and Korean Literature from Ewha Womans' University, Seoul, South Korea. She is expected to receive a Ph.D. in Management Information Systems from Texas Tech University. Previously, she was a Lecturer in the Rawls College of Business at Texas Tech University. (Appointment is contingent upon successful work authorization; Rank is contingent upon successful completion of Ph.D. requirements by July 25, 2024)

Yo Han Lee $73,000 7/25/24 10 Mos
Assistant Professor
Department of Human Movement Sciences
Tenure Track

Dr. Lee received a Ph.D. in Sport Administration from the University of Colorado, an M.S. in Sport Management from Temple University, and a B.S. in Business Administration from The Pennsylvania State University. Previously he was an Assistant Professor of Sport Management in the Business, Education and Social Work Department at Defiance College. (Appointment is contingent upon successful work authorization)

Amber Matthews $73,000 7/25/24 10 Mos
Assistant Professor
Department of STEM Education & Professional Studies
Tenure Track

Ms. Matthews received an MLIS in Library and Information Science from Western University and a B.A. in International and Comparative Studies from Huron University College. She is expected to receive her Ph.D. in Library and Information Science from Western University. Previously she was a Lecturer in the Department of Media, Information, and Technoculture at Western University. (Appointment is contingent upon successful work authorization. Rank is contingent upon completion of Ph.D. by July 2024)

Omolola A. Ologunorisa $71,000 7/25/24 10 Mos
Assistant Professor
Department of Political Science & Geography
Tenure Track

Dr. Ologunorisa received a Ph.D. in Geosciences from the University of Missouri-Kansas City, a Master of Agricultural Technology in Forest Resources Management and a Bachelor of Agricultural Technology in Forestry and Wood Technology from Federal University of Technology, Akure, Nigeria. Previously she was Lecturer in the Department of History and Geography at the Georgia College & State University.

Marcella G. Otto $66,000 7/25/24 10 Mos
Lecturer
Department of Human Movement Sciences

Dr. Otto received a Ph.D. in Kinesiology from Louisiana State University, an M.S. in Sport Studies, and a B.S. in Sport Administration from Southern Illinois University. Previously she was an Assistant Professor in the Department of Sports Science and Wellness at Hampton University. (Appointment is contingent upon successful work authorization)

Ayse N. Ozturk $74,200 7/25/24 10 Mos
Assistant Professor
Department of Teaching & Learning
Tenure Track

Dr. Ozturk received a Ph.D. in STEM Education from The Ohio State University, an M.A. in Mathematics from Sam Houston State University, and a B.S. in Mathematics from Hacettepe University in Ankara, Turkey. Previously she was a Lecturer of Mathematics Education in the Department of Teaching and Learning at The Ohio State University. (Appointment is contingent upon successful work authorization)

Robert Podschwadt $100,000 1/10/24 12 Mos
Research Assistant Professor
School of Cybersecurity
Restricted

Dr. Podschwadt received a Ph.D. from Georgia State University, an M.S. in Computer Science and Media and a B.Sc.in Media Informatics from Stuttgart Media University, Stuttgart, Germany. Previously he was a doctoral student studying machine learning for security critical tasks. (Appointment is contingent upon successful work authorization.)

Dineshkumar Rajendran $68,000 7/25/24 10 Mos
Lecturer
Interdisciplinary Studies

Mr. Rajendran received an M.S. in Multimedia Technology from Anna University, Tamil Nadu, India and is pursuing his Ph.D. in Game-Based Learning from Vellore Institute of Technology, Vellore, India. Previously he was an Assistant Professor in the Department of Multimedia & Animation in the School of Design and Vellore Institute of Technology.

Mary Victoria Reynolds $84,000 7/25/24 10 Mos
Assistant Professor
Department of Communication Sciences & Disorders
Tenure Track

Dr. Reynolds received a Ph.D. in the School of Paediatrics and Child Health from the University of Western Australia, Perth, Australia, a B.S. in Human Communication Science from Curtin University, Perth, Australia, and a Bachelor of Laws from Osaka University, Suita, Japan. Previously she was an Associate Professor in the Master of Science – Speech Language Degree program at Lewis University.

Deanna Robin $105,000 12/10/23 12 Mos
Visiting Clinical Assistant Professor
School of Nursing
Restricted

Ms. Robin received an M.Sc. and B.Sc. in Nursing from Chamberlain University. Currently she is a Family Nurse Practitioner at the Children's Specialty Group in Virginia Beach.

Dana L. Rognlie $56,250 7/25/24 10 Mos
Lecturer
Department of Philosophy & Religious Studies

Dr. Rognlie received a Ph. D and an M.A. in Philosophy from the University of Oregon, and a B.A. from Concordia College at Moorhead. Previously she was a Visiting Assistant Professor of Philosophy at Wabash College.

Derek P. Siegel $75,000 7/25/24 10 Mos
Assistant Professor
Department of Sociology & Criminal Justice
Tenure Track

Derek Siegel received an M.A.in Sociology from the University of Massachusetts, Amherst and a B.A. in Women's, Gender, and Sexuality Studies from American University.

They are expected to receive a Ph.D. in Sociology from the University of Massachusetts, Amherst. Previously they were a Graduate Instructor in the Women, Gender, and Sexuality Studies Department at the University of Massachusetts, Amherst. (Rank is contingent upon completion of Ph.D. by July 2024)

Rex W. Sitti Assistant Professor Department of Economics Tenure Track	$115,000	7/25/24	10 Mos

Mr. Sitti received an MBA in International Business from the University of Memphis, an M.A. in Economics from The University of New Mexico, and a Bachelor of Commerce in Finance and Accounting from Kenyatta University, Kahawa, Nairobi. He is expected to receive a Ph.D. in Public Economics from the University of New Mexico. Previously he was a Research Assistant in the Department of Psychiatry and Behavioral Sciences at the University of New Mexico. (Appointment is contingent upon successful work authorization. Rank is contingent upon completion of Ph.D. by July 2024. $15,000 stipend provided for participation in the Economic Forecasting Project, State of the Region Report, and State of the Commonwealth Report as a member of the Dragas Center for Economic Analysis & Policy.)

Melissa L. Sullivan Assistant Professor Dental Hygiene Tenure Track	$80,000	7/25/24	10 Mos

Ms. Sullivan received an M.S and B.S. in Dental Hygiene from Old Dominion University. She is expected to receive a Ph.D. in Health Services Research from Old Dominion University. Previously she was an Adjunct Clinical Faculty in the Department of Dental Hygiene at Old Dominion University. (Rank is contingent upon successful completion of Ph.D. by July 2024.)

Rewati R. Ujjwal Post-Doctoral Research Associate Center for Bioelectronics Restricted	$45,000	3/12/24	12 Mos

Dr. Ujjwal received a Ph.D. in Chemistry from the Rajiv Gandhi Institute of Petroleum Technology, Jais, India, and an Integrated M.Sc. in Chemical Sciences from the National Institute of Science Education Research, Bhubaneswar, India. Previously he was a Postdoctoral Scholar in the Department of Pharmaceutical Sciences, College of Pharmacy at Oregon State University-Oregon Health & Science University. (Appointment is contingent upon successful work authorization.)

Julie Jo A. Walters Lecturer Department of Biological Sciences	$58,000	12/25/23	10 Mos

Ms. Walters received an M.S. in Ecology and Evolution from Florida State University, a B.S. in Zoology, and a B.A. in German from the State University of New York College at Oswego. Previously she was an emergency hire in the Department of Biological Sciences at Old Dominion University.

Thea C. Williamson Assistant Professor Department of English Tenure Track	$75,000	7/25/24	10 Mos

Dr. Williamson received a Ph.D. and an M.Ed., in Curriculum and Instruction, Language and Literacy Studies from the University of Texas at Austin, and a B.A. in Spanish and Comparative Literature from Haverford College. Previously she was an Assistant Professor in the Department of Literacy Studies, in Seidel School of Education and Salisbury University.

Natalie M. Yarish Assistant Professor School of Kinesiology Tenure Track	$90,000	7/25/24	10 Mos

Dr. Yarish received a Ph.D. in Health Behavior and Health Education from the University of Texas, an M.A. in Health Education from Columbia University and a B.A. in Psychology from the University of Colorado, Boulder. Previously she was a Research Scientist at the Veterans Medical Research Foundation in San Diego, CA.

Yuting Zhu Assistant Professor Department of Chemistry & Biochemistry Tenure Track	$87,000	7/25/24	10 Mos

Dr. Zhu receive a Ph.D. in Environmental Chemistry from the State University of New York, and a B.S. in Environmental Science from Nanjing University, Nanjing, China. Previously she was a Postdoctoral Investigator at Woods Hole Oceanographic Institution. (Appointment contingent upon successful work authorization)

April 18, 2024

EMERITUS/EMERITA APPOINTMENTS

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the title of emeritus/emerita for the following faculty members and faculty administrators. A summary of their accomplishments is included.

Name and Rank	Effective Date
John A. Adam University Professor Emeritus and Professor Emeritus of Mathematics & Statistics	June 1, 2024
Linda K. Bennington Clinical Associate Professor Emerita of Nursing	June 1, 2024
David Branch Associate Professor Emeritus of Kinesiology and Health Science	June 1, 2024
Janet E. Brunelle Master Lecturer Emerita of Computer Science	June 1, 2024
Thomas Chapman Associate Professor Emeritus of Political Science & Geography	June 1, 2024
Fred C. Dobbs Professor Emeritus of Ocean and Earth Sciences	June 1, 2024
Ike L. Flory Associate Professor Emeritus of Engineering Technology	June 1, 2024

Lisa Horth — June 1, 2024
Professor Emerita of Biological Sciences

Sue C. Kimmel — June 1, 2024
Professor Emerita of STEM Education & Professional Studies

Mounir Laroussi — June 1, 2024
Professor Emeritus of Electrical & Computer Engineering

Mary Barclay Porter-Troupe — June 1, 2024
Senior Lecturer Emerita of English

Zia Razzaq — June 1, 2024
Professor Emeritus of Civil & Environmental Engineering

P. Thomas Vernier — April 1, 2024
Research Professor Emeritus of the Frank Reidy
Research Center for Bioelectrics

John R. Waitekus — January 1, 2024
Physician Emeritus of Student Health Services

JOHN A. ADAM

John A. Adam received a BSc. (First Class Honors) in Physics from the University of London (Queen Elizabeth College), UK and a Ph.D. in Theoretical Astrophysics, also from the University of London (University College). He joined Old Dominion as a full professor of mathematics in January 1984. Recognition of his accomplishments in teaching, research and service include being selected as one of Old Dominion University's "Outstanding Faculty Members" in 1989, a recipient of the Gene W. Hirschfeld Award for Faculty Excellence in the College of Sciences and Health Professions in 1990 and was designated a University Professor in 1999. In 2007 he was a recipient of the SCHEV Outstanding Faculty Award from the State Council of Higher Education for Virginia, ODU's Outstanding Researcher Award. In 2012 he was a recipient of a Carl B. Allendoerfer Award from the Mathematical Association of America (MAA). (The Award is made to authors of expository articles published in the MAA journal Mathematics Magazine.) During the period 1986-2005 he was recipient as Co-PI of approximately $1.5M in grants from various agencies (including NSF and NASA).

He has published approximately 120 papers in mathematical and scientific journals and given over 180 talks and presentations in his capacity as an Old Dominion faculty member to professional and university/college groups. He has been a frequent contributor to Earth Science Picture of the Day. In addition, he is Section Editor of *Mathematics in Nature* for the journal *Virginia Mathematics Teacher*. He also writes a monthly column on "Guesstimation" for *The Physics Teacher* journal.

He has authored several books: *Mathematics in Nature: Modeling Patterns in the Natural World*, *X and the City: Modeling Aspects of Urban Life* and *A Mathematical Nature Walk*. He is also co-author of *Guesstimation: Solving the World's Problems on the Back of a Cocktail Napkin*. His latest book, *Rays, Waves and Scattering: Topics in Classical Mathematical Physics* was published in June 2017. He is currently in the process of writing an updated version of his very first book, *Mathematics in Nature*, and another textbook called *Nature's Mathematical Tapestry*.

LINDA K. BENNINGTON

Dr. Linda Bennington received a B.S. in Chemistry and an MS in Biochemistry and Nutrition from West Virginia University in 1967. She also earned a BSN and MSN with an emphasis in Perinatology from Old Dominion University and went on to earn a Ph.D. in Nursing from Virginia Commonwealth University. She joined Old Dominion as an adjunct faculty member teaching the Childbearing Family in the clinical environment from 1999 – 2001 and joined the full-time faculty in the School of Nursing teaching the Growing Family, Medical Physical Sciences, Community Health, Spirituality in Nursing, and Global Health and Maternal Infant Nursing from 2001 to present. Her impact is far reaching and has resulted in many acknowledgements and awards over her career including a commendation from M. Norman Oliver, Acting State Health Commissioner for valuable contribution to maternal health and elected Chair of the Virginia Breastfeeding Advisory Committee through the Virginia Department of Health.

Dr. Bennington has been dedicated to serving others throughout her professional career. She has served such entities as AWHONN's Research Advisory Committee, the Global Nursing Education Group, as a peer auditor for Chemically Dependent Nurses for the State of Virginia, as faculty advisor for Chi Eta Phi sorority, as a member of several ODU committees including the Faculty Review Committee, the Curriculum Committee, the Internal Review Board Committee and the Panel for Mental Health in Williamsburg, Va.

Dr. Bennington's scholarship has centered around a wide range of nursing science topics including publications in peer-reviewed journals such as the Journal of Interprofessional Education & Practice, Clinical Simulation in Nursing, The American Journal of Maternal/Child Nursing, the Journal of Holistic Nursing, Newborn and Infant Nursing Reviews, Maternal Child Nursing, and the Publication of the Association of Women's Health, Obstetric and Neonatal Nurses. She has also co-authored manuscripts published in the Encyclopedia of Nursing and Allied Health and the Encyclopedia of Cancer with an emphasis on chemoembolization, histiocytosis X, Horner's Syndrome, disseminated intravascular coagulation, and hemolytic anemia.

DAVID BRANCH

John David Branch (Dave) earned a B.A. degree from Furman University (1978) and M.S. (1980) and Ph.D. (1993) degrees from the University of South Carolina-Columbia. Prior to his employment at Old Dominion University (ODU, 1994-2024), he was a lecturer at Furman University (1987-1990). He served as the undergraduate exercise science program coordinator (1997-2005), Interim Chair of the Department of Exercise Science, Sport, Physical Education, and Recreation (ESPER, 2002-2003), ESPER Chair (2003-2006), and Associate Dean for Undergraduate Education and College Services in the Darden College of Education (DCOE, 2005-2011). He authored 27 peer-reviewed papers, six book chapters, and was honored by six ODU graduating DCOE College Scholars as their most inspiring faculty member.

JANET BRUNELLE

Janet Brunelle received a B.S. in Computer Science from Old Dominion University in 1980 and an M.S. in Computer Science from ODU in 1987. She joined the National Aeronautics and Space Administration as an aeronautical engineer in 1981 performing research in the area of Software Reliability. She became an adjunct instructor for ODU in the Computer Science Department (1995) and the Office of Community Outreach (1990). Janet was hired as a full-time Instructor in CS in 1998, was promoted to Lecturer in 2000, to Senior Lecturer in 2006, and Master Lecturer in 2021. She received the prestigious COS Above and Beyond Award in 2022 for exemplary service to the College.

Mrs. Brunelle has taught courses at the freshman, junior, and senior levels including both Distance Learning and face-to-face formats. She was one of the first faculty members to teach through the satellite delivery mode and was part of the CS program to innovate online instruction. She developed online instructional pedagogy for the department and was the designer of content for five courses. Janet served on multiple interdisciplinary committees (provost appointed) to evaluate and design content for university freshmen courses (First Year and University College).

In service to the Department, Mrs Brunelle was appointed as Assistant Chair in 2000 and remains in that role. She led all BSCS advising as Chief Departmental Advisor (2000 – 2023) with an advising load of 400 – 850 students each term. She was awarded College of Sciences Advisor of the Year six times and was awarded two NACADA honors including Faculty Advisor of the Year – Region 2 (2007). She was selected as Most Inspirational Faculty Member for top graduates on 14 occasions. During her employment, Janet was selected Most Inspirational Faculty Member for three COS Banner Carriers and two Kaufman Award winners.

Janet served as Undergraduate Program Director (2000 – 2023). She led the Undergraduate Committee through multiple curriculum changes. She led the creation of the BS in CS with Teacher Licensure, and the creation of two very successful Linked BS to MS programs. She designed and developed the BSCS undergraduate web pages until 2020 when she coordinated the transfer of the pages to the university for oversight.

In service to the University, Mrs Brunelle was appointed Chair of the COS Undergraduate Committee (2002-2022) and the University Policies and Procedures Committee (2002-2022). She was also selected to serve on University Committees that include: University College, Foundations of Excellence Steering, Learning Communities, Domicile, Enrollment Management, Experiential Learning, Master Advisor, and Cyber Security. She has been a part of numerous hiring/search committees at the department, college, and university levels.

Janet was selected to be in the first cohort of Entsminger Fellows for Entrepreneurship at ODU. She participated in educational programs at Babson College and developed a pedagogy for teaching courses in entrepreneurship at the university and department levels.

THOMAS CHAPMAN

Dr. Chapman received a B.A. in Geography from Michigan State University, a M.A. in Geography from the University of Toledo, and a Ph.D. in Geography from Florida State University. He joined Old Dominion as an assistant professor of geography in 2009 and achieved the rank of associate professor in 2015.

Recognition of Dr. Chapman's accomplishments in teaching include: The Higher Education Distinguished Teaching Award from the National Council for Geographic Education, the Excellence in Teaching Award from the Southeastern Division of the Association of American Geographers, and the ODU College of Arts and Letters' Joel S. Lewis Faculty Award for Excellence in Student Mentoring.

Dr. Chapman taught twelve different courses in Geography and American Studies, advised numerous geography undergraduate students, and served on graduate committees for students in the Graduate Program in International Studies, Public Administration, and Humanities. Within the profession, he served as Chair of the Nominations Committee of the Southeastern Division of the Association of American Geographers, and served ODU as Chair of the College of Arts and Letters' Dean's Advisory Council, Chair of the College's Scholarship Committee, and Chair of the College's Technology Committee.

Dr. Chapman's research is in the area of human geography, primarily concerning the geographies of identity, sexuality and public space, and his research was recognized with the Outstanding Journal Article of the Year Award from the editors of the journal, the *Southeastern Geographer.*

FRED C. DOBBS

Professor Fred C. Dobbs, a biological oceanographer, is retiring after more than 40 years in academia, 31 of them at Old Dominion University. He received his A.B. (Biology, Honors) from Franklin and Marshall College, his M.S. (Zoology) from University of Connecticut, and his Ph.D. (Oceanography) from Florida State University. Subsequently, he held institutional post-doctoral positions at State University of New York at Stony Brook (now Stony Brook University) and the University of Hawaii's School of Ocean and Earth Science and Technology

(SOEST). He joined the then-named Department of Oceanography at Old Dominion University as an Assistant Professor position in 1993, was tenured in 1999, and promoted to full professor in 2006. From 2017 through July 2023, he served as Chair of the Department of Ocean and Earth Sciences (OES).

His scientific credentials include a broad research program with more than $4.5M from a diverse array of federal, state, and private funding sources, including the National Science Foundation, NOAA (and NOAA Sea Grant), Office of Naval Research, Department of Energy, Environmental Protection Agency, US Coast Guard, and the Great Lakes Protection Fund. Between 2009 and 2014, he served as the lead Principal Investigator for a $2.3M NSF collaborative award to four principal investigators distributed across four universities. He reviewed manuscripts sent him by editors of 60 journals, grant proposals from more than 25 funding agencies, and 4 books. He wrote or co-authored more than 70 peer-reviewed scientific publications, many featuring students and post-doctoral scholars as co-authors.

At the scientific interface of invasions biology and marine microbial ecology, he has a national and international reputation demonstrated by memberships on advisory panels and boards having a focus on invasive species. In 2010-2011, he served on both a U.S. EPA Science Advisory Board Panel and a National Research Council/National Academy of Sciences Committee, each of which produced a report concerned with the discharge of nonindigenous organisms in ships' ballast water. His other research interests include the ecology of microorganisms on particles in the water column and more recently, on microplastics in the ocean. In these several research arenas, he established international collaborations and has colleagues in China, Denmark, Korea, and Taiwan.

He supervised 7 post-doctoral scholars, graduated 3 PhD and 18 MS students, and managed the research projects of 17 undergraduate and 4 high-school students. His ODU honors include his selection for the inaugural cohort of Provost's Fellows (2015-2016) and nominations for the Hirschfield Faculty Excellence Award, the Tonelson Teaching Award, and the SCHEV Outstanding Professor Award.

IKE L. FLORY

Ike Flory joined Old Dominion University in August of 2002. He has served the Department of Engineering Technology as Assistant Professor, Associate Professor, Laboratory Director, Program Director, and Department Chair. Dr. Flory has provided service to the university including, but not limited to, serving as a member or chair of numerous faculty and staff search committees, graduate student committees, faculty awards committees, and as co-chair of the SACSCOC faculty committee to support the 2023 university reaffirmation.

Dr. Flory has developed and delivered courses energy systems, electrical theory, electronics, and technical analysis. He has performed research in the areas of artificial illumination, energy conversion, energy conservation, alternative energy sources, and engineering education, serving as PI or co-PI on projects totaling $1,954,177. He has 50 publications as either a sole or joint author. These publications include journal articles, conference proceedings, published technical reports, thesis/dissertations, and United States patents.

Isaac L. Flory IV received his B.S., M.S., and Ph.D. degrees in Electrical Engineering from Virginia Tech in 1984, 1993 and 2008 respectively. He has over 17 years of experience in the lighting industry, having served in several positions as an employee of Hubbell Lighting Incorporated including Manager of Electrical Engineering and Intellectual Property Coordinator. He currently serves as a technical consultant to the non-profit National Association of Architectural Metal Manufacturers. He has been awarded 25 United States Patents, served as an expert witness, and is a licensed Professional Engineer in the Commonwealth of Virginia.

LISA HORTH

Dr. Lisa Horth was one of the first women Full Professors in the Department of Biological Sciences and has received several awards while at Old Dominion University, including the Broderick Diversity Champion Award. She received her Ph.D. in Ecological Genetics from Florida State University and her M.S. in Conservation Biology from the University of Maryland, College Park. She has received over 40 scientific grants, written multiple book chapters, and 30 publications including those for the federal, state, and private sector. Dr. Horth has taught many different courses during her tenure at ODU, most recently Conservation Biology & Sustainable Development, a lecture-lab course, and Modern Plant-Animal Interactions, a university-level writing intensive course. She has mentored both graduate and undergraduate research.

Lisa Horth's research focus of late has included conservation biology, or more specifically, investigating ecological factors associated with the stability of populations of plants that are endangered and whose global distribution includes only near small ponds in the mountains of Virginia. Her research group has discovered a new method of seed germination that may prove beneficial to stabilizing these populations and demonstrated that this plant's basic breeding system is very different than what was previously though. Dr. Horth's most recent research involved applied ecology where she worked to improve methods of strawberry production on farms using supplemental native bees and indoors using the methods of hydroponic farming, which she has received research and outreach funding for. With that funding Lisa Horth has shared her knowledge with Teens with a Purpose, a local group receiving national attention working to improve the lives of teens from low income, high crime areas. Dr. Horth's expertise is ecological genetics and conservation.

SUE C. KIMMEL

Dr. Sue Kimmel received a B.S. in Mathematics from Guilford College, an MSLS from the University of North Carolina at Chapel Hill, and a Ph.D. in Curriculum and Instruction from the University of North Carolina at Greensboro. Dr. Kimmel joined Old Dominion as an assistant professor of library science in 2010, achieved the rank of associate professor in 2016 and professor in 2022. Prior to joining the faculty at Old Dominion University, Dr. Kimmel was the Bibliographer and a Selector for the *Elementary School Library Collection*, a biennial publication used nationally to build collections for youth in preschool through grade 6. She completed coursework leading to North Carolina licensure from UNCG, earned National Board Certification, and served as a school librarian in NC public schools for 16 years.

Recognition of her accomplishments in teaching, research and service at ODU include the Inaugural Alumni Association New Faculty Award, the University Teaching with Technology Award and the DCEPS Publications Award. Professionally, her publications have earned the American Association of School Librarians Research Paper Award, the Media, Culture and Learning SIG AERA Best Empirical Paper Award, and a Virginia Hamilton Essay Honor.

Dr. Kimmel has developed and taught over fifteen graduate courses in library studies and in the PhD program in Teaching and Learning. She chaired five dissertation committees with service on an additional five. She has served as the Graduate Program Director for Library and Information Studies program since April 2016. While director, the program moved from a Master of Science in Education with a concentration in School Librarianship to a Master of Library and Information Studies preparing professionals to work in a variety of library and information settings. She was instrumental in shepherding the program through Candidacy and Self-Study leading to accreditation from the American Library Association. Student enrollments, course offerings, and the size of the faculty have increased significantly under her leadership.

Dr. Kimmel's research concerns school librarianship and access to quality literature and information for youth. Most recently her research has concerned threats to intellectual freedom and the right to read for youth. She has authored 53 published papers, 12 book chapters, and 5 books. Dr. Kimmel made 74 presentations at National and International professional conferences, was a frequent speaker at state and regional conferences, and has been invited to several podcast interviews. She was PI on two national grants, co-PI on two, and a contributor to an additional three.

MOUNIR LAROUSSI

Dr. Mounir Laroussi received his PhD degree in Electrical Engineering from the University of Tennessee, Knoxville. He joined the Electrical and Computer Engineering Department of Old Dominion University in 2003 as an associate professor and achieved the rank of professor in 2008. He served as the director of the ODU Laser and Plasma Engineering Institute from 2007 to 2014, and as the director of ODU's Plasma Engineering and Medicine Institute from 2014 to 2024. He was the recipient of the ECE Department's Excellence in Teaching Award in 2006 and 2014. He was the recipient of the Batten College of Engineering and Technology Excellence in Research Award in 2005 and the recipient of ODU's Research Achievement Award in 2009. In addition, Dr. Laroussi was the recipient of several prestigious awards on the national and international stage in the field of low temperature plasma physics and its biomedical applications, a field where he is recognized as a pioneer and a leading authority. His achievements have been acknowledged through his elevation to the esteemed rank of Fellow in the IEEE, American Physical Society, and the International Plasma Chemistry Society.

Dr. Laroussi supervised 7 post-doctoral associates, 10 PhD and master's students at ODU. He also served as a member of many PhD dissertation committees for students of the ECE Department, the MAE Department, and the Physics Department. He established international collaborations (France, Germany, Japan) where students from these schools benefited from his supervision.

Dr. Laroussi's research concerns the science and engineering of low temperature plasmas and their biomedical applications. He has published more than 200 papers in refereed journals and conference proceedings. He has an H-index of 56 in March 2024 (the highest in the BCET college) and his papers have been cited more than 19,000 times. He has consistently been ranked in the top 2% of researchers in the world. He has also authored and co-edited a total of 4 books and contributed 8 chapters to other books. While at ODU he has obtained a total of 22 grants totaling more than $4.4M. He was chair of various conferences and served (and still serves) on editorial boards of several scientific journals. In addition, he frequently gave keynote talks and invited presentations at top international conferences.

MARY BARCLAY PORTER-TROUPE

Mary B. Porter-Troupe received a B.A. in English from the University of North Carolina at Chapel Hill in 1976 and a Masters in English from Old Dominion University in 1999. She joined Old Dominion as a Teaching Assistant, Adjunct, and then served as an instructor, and later achieved Lecturer and Senior Lecturer status in 2012. Mary taught both Literature (112, 114) and Composition courses (110, 211, 123) as well as 300 level courses (Shakespeare 303 and 304) and Introduction to British Literature (301 and 302). Recognition of her accomplishments in teaching include two Shining Star Awards for promotion of student learning and success, appreciation for student support in a Student Success Luncheon and Ceremony, and acknowledgement of contributing to student success (Freshman Awards Ceremony). In addition, she has maintained consistently high ratings in Student Opinion Surveys over the years. She has also provided one-on one tutoring for local high school students and provided community service by offering volunteer tutoring for underserved students.

Mary has served and still serves on the General Education Committee and Gen. Ed. Subcommittee and has participated in the design of SLOs, assessment of student writing, and proposal and implementation of department goals and objectives for Literature and Composition courses. She participated over the years in other committees including Student Recruitment, Alumnae Public Relations, and Textbook Selection (English 114). For the last ten years she has served in an advising capacity (first as regular faculty responsibilities and second as a member of the Advising Committee) to assure that assigned undergraduates understand, navigate, and meet the requirements for graduation. In 2016, she served on the committee to plan and launch the Shakespeare 400 Years Later Conference which took place at Old Dominion University. She chaired the committee on Promotions and acted as liaison to local media to secure TV (public service announcements), radio (interviews, public service announcements), and print coverage (feature articles in the Virginian Pilot, press releases in local magazines) for the various events that were a part of the conference.

In addition, Mary designed, at the request of a senior faculty member, a Topics course, Introduction to the Renaissance, the purpose of which was to allow students to make connections between assigned texts and the surrounding cultural texts that so powerfully informed their creation. Attention was placed on such pivotal thinkers as Machiavelli (*The Prince*), Castiglione (*The Book of the Courtier*), and Montaigne (selected essays). The course creates a framework that would enable students to actively engage with how specific texts (by Shakespeare, Marlowe,

Jonson, Kyd, etc.) both reflect and respond to the larger cultural, social, and ideological issues of the day. Reciprocity between text and context was the emphasis. Mary strives to impart her love for language, narrative and art in a way that hopefully assures its relevance and power in our ever-changing lives and world.

ZIA RAZZAQ

Dr. Zia Razzaq received a B.E. with Honors in Civil Engineering from University of Peshawar, Pakistan in 1966; M.A.Sc. (Master of Applied Science) from University of Windsor, Canada in 1968; and a D.Sc. (Doctor of Science) from Washington University St. Louis in 1974. He joined Old Dominion University as an Associate Professor of Civil and Environmental Engineering in 1982, achieved the rank of professor in 1988, and was designated University Professor in 2000 (the first in college history). Prior to joining ODU, he served as a full-time faculty member at the Arizona State University, Southern Illinois University at Carbondale, and the University of Notre Dame during 1974-1982. He also holds several FEMA certifications for various types of hazards mitigation. Examples from the 30 awards and recognitions he received are: NASA/ASEE Research Fellowships in 1982 and 1989; Morgan Scholarship Award for excellence in teaching and research in 1984; J. F. Lincoln Bronze Award in 1989 in a national competition jointly with his grad research student M. Bozbeyli; ODU College of Engineering Excellence in Teaching Award in 1999 (the very first in College history); Nominated for Virginia Engineering Educator of the Year Award in 2001; University Finalist for SCHEV Award in 2005, 2006, 2012, and 2013; State Finalist for SCHEV Award in 2012; Who's Who Among America's Teachers in 1996-1998, 2000, and 2004; ODU Shining Star Award in 2010, 2011, and 2015; and included in Outstanding People of the 20th Century, IBC, Cambridge, England in 1999.

Dr. Razzaq has served as the research advisor for 106 master's students of which 93 were at ODU, and 20 PhD dissertation students. He developed the Structural Engineering Research Laboratory at ODU using NSF and university funds and donations by NASA Langley Research Center and the industry and served as its director for 42 years. He had also developed a structures models testing lab at the University of Notre Dame using an NSF grant, and structures research labs at both Arizona State U and Notre Dame. His industry experience includes soil and rock testing at world's largest earth-fill dam named Tarbela Dam in Pakistan; storm sewage systems design at Russell Armstrong Consultants in Canada; automobile side impact research engineer at Chrysler Corporation in Detroit, Michigan; stress and structural research analyst at Monsanto Company; and underwater shock analyst of navy submarines at Newport News Shipbuilding.

Dr. Razzaq has conducted research in steel, reinforced and prestressed concrete, and wood structures in the civil engineering field; aerospace structures including outer space structures, supersonic aircraft wings and fatigue analysis; and advanced materials for PAC-3 missiles. He has received numerous grants from NSF, NASA, USDA, Virginia Power, SSRC, Lockheed Martin, and the industry. He has developed retrofitting methods for strengthening public and government buildings against shock loading caused by terrorist attacks; development of vibration control devices for NASA's future outer space floating structures; parallel computing methods for multi-layered composite materials for supersonic aircraft wings; nonlinear models of F-106 jet fuselage

components' fatigue analysis; development and testing of CFRP materials for Lockheed Martin's PAC-3 missiles' electronic housing at very high and low temperatures; dynamic analysis and fracture or collapse of tapered wood utility poles under hurricane forces; thermo-elasto-plastic instability analysis of columns and structural sub-assemblages in steel buildings including those in World Trade Center Towers 1 and 2 destroyed in the 9/11 events. He has published over 160 papers and presented several of them in 17 different countries. He has represented North America for built-up steel structural members, jointly with B.G. Johnston, in a 1986 international collaborative in Paris, France resulting in a chapter in a world view book related to stability of metal structures. He has served on numerous national and international task groups on stability of metal structures. He was elected Fellow of the American Society of Civil Engineers in 1988 and is a registered Professional Engineer in the Commonwealth of Virginia. He is also a Program Evaluator for the Accreditation Board for Engineering and Technology (ABET).

P. THOMAS VERNIER

Research Professor P. Thomas Vernier came to Old Dominion University (ODU) in 2013 from the University of Southern California (USC), where he worked for 25 years as an electrical engineer. During his time at USC, he drew on his experience in semiconductor and microelectronics engineering and his previous training in microbiology and chemistry to earn an electrical engineering Ph.D. in what we could now call bioelectrical engineering. He accepted a research faculty position at USC and continued to shape and sharpen his signature research focus: to understand better, through hypothesis-driven, mechanism-based inquiry, the effects of membrane-permeabilizing pulsed electric fields on biological systems, by identifying and characterizing the initial cellular, subcellular, and molecular events after exposure to an intense electric field.

With a team of USC graduate students, Prof. Vernier developed a methodology that is an interwoven combination of molecular simulations and imaging of living cells before, during, and after application of an external electric field. With these tools he demonstrated that cell membranes are permeabilized even by the very short (nanosecond) electric pulses studied by bioelectrics researchers, and he identified a molecular mechanism for the externalization of normally cytoplasm-facing membrane lipids that is observed immediately after pulsed electric field exposure. He also published the first systematic description of the time course of lipid electropore creation and annihilation, processes which take place within a few nanoseconds, and he showed that, even on this time scale, increasing the magnitude of the external field is equivalent to increasing the transmembrane voltage, and that this increases the probability of pore formation without significantly changing the pore formation time, once initiated. This last point represents a convergence of newer molecular models based on interatomic interactions with the older continuum models based on fields and bulk material properties. Dr. Vernier was also involved, with his colleague and mentor at USC, Martin Gundersen, oncologists at USC and UCLA, and biomedical engineers associated with the Alfred Mann Foundation, in early efforts to utilize the unique characteristics of intense submicrosecond electric pulses in cancer therapy.

After many productive years at USC, and now a leading researcher in the new field of nanosecond bioelectrics, in the U.S. and internationally, Vernier moved to Norfolk to join the

Frank Reidy Research Center for Bioelectrics at ODU. He brought with him not only his own experience and expertise, but also an international network of collaborators (Argentina, Croatia, Denmark, France, Germany, Poland, Romania, Slovenia, Spain, Sweden) who have contributed to the wide-ranging, interdisciplinary research environment at the Center. Vernier's Nanoscale Bioelectrical Physics laboratory has added to our understanding of the role of charge in the transport of ionized species into electropermeabilized cells and the importance of accurate ion models for molecular simulations of lipid electropore formation. Vernier also helped to lead recent studies showing inflammasome activation after nanosecond pulsed electric field exposures, which may lead to better control of the immune response after this treatment.
A member of the faculty of the annual International Scientific Course and Workshop on Electroporation-Based Technologies and Treatments in Ljubljana, Vernier is also a lecturer in the sister Workshop on Fundamental and Applied Bioelectric in Norfolk. Vernier's scientific and other contributions were recognized recently when he received the Frank Reidy Award for Outstanding Achievements in Bioelectrics.

JOHN R. WAITEKUS

John R. Waitekus MD received a B.A. from Boston State College in 1973. He earned his medical degree from Eastern Virginia Medical School in 1998. Dr. Waitekus worked as a carpenter for 20 years before completing medical school later in life. Before coming to Old Dominion University, he worked as a Family Physician with Sentara for ten years.

Dr. Waitekus has worked at Old Dominion University (ODU) for the past eleven plus years and helped us to achieve continuous re-accreditation with the Accreditation Association for Ambulatory Health Care as our infection control practitioner. After the retirement of our Medical Director in May 2021, as the sole MD on staff, Dr. Waitekus took on additional duties including the role of laboratory director. During his tenure at ODU as a Board-Certified Family Physician he brought the additional skill of acupuncture as a treatment modality for our students. On a daily basis, Dr. Waitekus is well known to our students as one who spends extra time explaining the etiology and treatment of their issues as well as how to maintain health. He makes sure to address all of a patient's questions which is especially important to our international student population. Dr. Waitekus is known to our team as a caring and compassionate provider who always checks in on the staff and brings them weekly treats.

He worked tirelessly during the COVID-19 pandemic, training our health center staff and the Athletic department staff on how to screen for COVID-19. He personally tested many hundreds of students and helped them navigate their COVID-19 infection including contacting them in the isolation and quarantine residential housing. He assisted in reducing the spread of COVID-19 and along with our team helped to keep the ODU campus safe. He served as the medical director for our administration of the COVID-19 vaccines secured through the Virginia Department of Health. He provided a response plan to mitigate the spread of the monkeypox virus and collaborated with the team to reduce the spread of meningitis and chicken pox on the campus during his tenure.

Dr. Waitekus has served as an educator, mentor, motivator, and expert collaborator in his field for the entire team at Student Health Services. He has also served as a preceptor for Eastern Virginia Medical School medical students and ODU nurse practitioner students. In efforts to build morale and reduce compassion fatigue he worked the late hours during the Summer and was on call during the entire winter holiday. Dr. Waitekus describes his experience at ODU as a home and family from day one, and he is eternally thankful.

Sushil K. Chaturvedi
Professor Emeritus of Mechanical & Aerospace Engineering

June 1, 2024

April 18, 2024

APPROVAL OF DOCTOR OF PHILOSOPHY DEGREE PROGRAM IN ELECTRICAL AND COMPUTER ENGINEERING DEGREE

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the proposed Doctor of Philosophy degree program in Electrical and Computer Engineering effective with the fall 2025 semester pending approval by the State Council of Higher Education for Virginia.

Rationale: Old Dominion University seeks approval to initiate a Doctor of Philosophy degree program in Electrical and Computer Engineering to begin in the fall of 2025.
The proposed program will be administered by the Department of Electrical and Computer Engineering in the Batten College of Engineering & Technology.

The proposed program will prepare students for engineering research and teaching careers in industry, government, research organizations, and educational institutions. Graduates with the proposed ECE degree will be able to make original contributions that help society in the grand challenges that we are facing and will face, including in autonomous and connected systems, smart cities, intelligent manufacturing, and smart materials. The program will have two core courses to expose the students to foundational tools and the remaining courses will be selected in coordination between the Graduate Program Director and a research advisor to meet the needs of the ECE degree.

The first main goal of this Ph.D. program is to prepare its graduates so they will be able to establish themselves as leaders in high-level engineering positions in industry and/or a government setting. Ph.D. graduates are employed as electrical and computer engineers supporting industries like automotive, manufacturing, systems integration, shipbuilding, aerospace, defense, telecommunications, etc. They are also employed as researchers by private research and development labs or by federally funded organizations (Jefferson Lab, NASA, or the Naval Research Laboratories). Some of our former doctoral students have also gone into academic careers doing postdoctoral fellowships or are working in universities as faculty members. The second goal of this Ph.D. program is to prepare its graduates so they will be able to continue to create engineering knowledge. The third goal of Ph.D. program is to prepare its graduates and encourage them to establish themselves as successful faculty members if they choose to join academia.

ODU would be the first university in Virginia to offer graduate degrees in electrical and computer engineering to meet current and future needs. There are shortages of qualified Electrical and Computer Engineers for New Market Opportunities and Global Competitiveness

Advanced Technology in the USA. According to the U.S. Bureau of Labor Statistics (BLS), two occupations long associated with innovation – electrical and electronics engineering – have all but stalled in their growth. The slow rate of growth in most manufacturing sectors is getting much of the blame for the stall in this occupation. This bleak view of the field is in direct contrast with industry claims that the United States has a massive shortage of skilled electrical engineers. American companies maintain that this is not an issue of declining demand, but rather one of declining investment in U.S. workers in favor of lobbying Congress for access to inexpensive foreign labor. Some observers claim that the demand for American electrical engineers would improve if the U.S. insisted that rockets that launch astronauts, satellites, weather, and GPS equipment were made in the U.S. The BLS predicts that most opportunities for electrical and electronics engineers will be with engineering service firms, as companies seek to reduce costs by contracting. Electrical engineers familiar with developing technologies in the areas of solar arrays, semiconductors, and communications will be best positioned to find jobs.

According to a CNBC report, the software developer (one field of computer engineering) shortage will be alarming in 2022. According to the U.S. Bureau of Labor Statistics (BLS), by 2030, the number of software job vacancies would rise by almost 22%. The average growth rate of software developers in the USA is only 8% right now, and that clearly emphasizes there is already an overwhelming and severe shortage of skilled workers. The talent shortfall starts with college graduates and advanced professionals in the fields of science, technology, engineering and mathematics (STEM). While a shortage of STEM workers will not stop a company's day-to-day operations, it can hamper the pace of growth for the whole industry and, subsequently, have an impact on the competitiveness of entire countries or regions.

The doctoral program prepares students for academia, research laboratories, and industry careers. In 2023, universities in the state of Virginia posted positions for tenure-track and research faculty, including positions seeking expertise in cyber-physical systems (Hampton University), integrated microsystems design and fabrication (Virginia Tech), and statistical estimation, signal processing, and wireless communications (University of Virginia). With their unique electrical and computer engineering foundation, our doctoral students can succeed in these positions by integrating their expertise in electrical engineering and computer systems. The federal government (e.g., U.S. Army Corps of Engineers, Fort Belvoir) and industry (e.g., Amentum, Dahlgren) have positions for applicants with a Ph.D. degree who can design and develop systems at the crossroads of electrical and computer engineering. Graduates of our Ph.D. in Electrical and Computer Engineering will be needed to ensure that the Virginia Clean Economy Act will deliver practical and innovative solutions while spurring economic growth.

The proposed PH.D. in ECE responds to the need for electrical and computer professionals in the Commonwealth of Virginia, the nation, and the world. In recent U.S. Bureau of Statistics, employment of computer and information research scientists is projected to grow 20 percent from 2020 to 2030, much faster than the average for all occupations. About 9,700 openings for computer programmers are projected each year, on average, over the decade. Overall employment of electrical and electronics engineers is projected to grow 7 percent from 2020 to 2030, about as fast as the average for all occupations. "There are more computers on the manufacturing floor than machine tools and other types of equipment," said Judy Marks, CEO of Siemens USA. More and more factory jobs now demand education, technical know-how or

specialized skills. And many of the workers set adrift from low-tech factories lack such qualifications[4]. In addition, although computer and information research scientists typically need a master's or higher degree in computer related field, such as electrical and computer engineering, employers prefer to hire candidates who have a Ph.D. Focusing on cutting edge education and training will be essential for Virginia's and U.S. high technology workforce and economic development as occupations in the electrical and computer industry are highly in demand and among the fastest growing in the economy. The proposed degree program will contribute to addressing such needs by preparing students to understand electrical and computer engineering principles and develop more innovative and advanced systems. Graduates will become the next generation in the high technology workforce to safeguard U.S. the leadership in technology.

TABLE OF CONTENTS

PART I: DESCRIPTION OF THE PROPOSED PROGRAM.. 1

A. PROGRAM BACKGROUND..... 1
B. INSTITUTION MISSION 3
C. DELIVERY FORMAT 3
D. ADMISSION CRITERIA……...3
E. CURRICULUM 4
F. TIME TO DEGREE 7
G. FACULTY RESOURCES 7
H. STUDENT ASSESSMENT 8
I. EMPLOYMENT SKILLS 12
J. RELATIONSHIP TO EXISTING ODU DEGREE PROGRAMS 14

PART II: JUSTIFICATION FOR THE PROPOSED PROGRAM.……..…….……4

A. RESPONSE TO CURRENT NEEDS (SPECIFIC DEMAND) 14
B. EMPLOYMENT DEMAND …… 18
C. STUDENT DEMAND …….. ..21
D. DUPLICATION 22

PART III: SUMMARY OF PROJECTED STUDENT ENROLLMENT IN PROPOSED PROGRAM…….25

PART IV: PROJECTED RESOURCE NEEDS …….……...……..…25

RESOURCE NEEDS ……..25
RESOURCE NEEDS: PARTS A-D 27

APPENDICES ……..……..…….31

APPENDIX A - SAMPLE PLAN OF STUDY
APPENDIX B - COURSE DESCRIPTIONS
APPENDIX C - FACULTY CURRICULUM VITAE (ABBREVIATED)
APPENDIX D – EXTERNALLY FUNDED GRANTS
APPENDIX E - EMPLOYMENT DEMAND-LETTERS OF SUPPORT
APPENDIX F - EMPLOYMENT DEMAND-EMPLOYER SURVEY
APPENDIX G - EMPLOYMENT DEMAND-JOB ANNOUNCEMENTS
APPENDIX H - STUDENT DEMAND-STUDENT INTEREST SURVEYS

Part I: Description of the Proposed Program

A. Program Background

Old Dominion University in Norfolk, Virginia requests approval to initiate a Doctor of Philosophy (Ph.D.) degree program in Electrical and Computer Engineering (ECE) with CIP Code 14.4701. This proposed degree program will supersede the concentration in ECE of the Ph.D. in General Engineering degree with CIP Code 14.0101 that is currently being offered. The proposed program will be administered by the Department of Electrical and Computer Engineering in the Batten College of Engineering & Technology and is to be initiated by Fall 2025.

The proposed Ph.D. ECE degree will prepare students for engineering research and teaching careers in industry, government, research organizations, and educational institutions. Graduates with the proposed ECE degree will be able to make original contributions that help society in the grand challenges that we are facing and will face, including in autonomous and connected systems, smart cities, intelligent manufacturing, and smart materials. The program will have two core courses to expose the students to foundational tools and the remaining courses will be selected in coordination between the Graduate Program Director and a research advisor to meet the needs of the ECE degree.

B. Institutional Mission

The mission of the institution states: "Old Dominion University, located in the City of Norfolk in the metropolitan Hampton Roads region of coastal Virginia, is a dynamic public research institution that serves its students and enriches the Commonwealth of Virginia, the nation and the world through rigorous academic programs, strategic partnerships, and active civic engagement." The Master of Science in Electrical and Computer Engineering aligns with this mission by (1) offering a robust curriculum that trains individuals in the field of Electrical and Computer Engineering, (2) addressing the critical shortage of employees and managers in the electrical and computer engineering workforce, (3) strengthening ODU's commitment to contributing to the economy and workforce of the Hampton Roads region and the Commonwealth of Virginia, and (4) enhancing the partnerships that ODU has developed throughout the region.

C. Delivery Format

The courses of the proposed Ph.D. ECE degree will be available in both online and on campus formats. Online course access will be through Zoom, the University's course management system. The courses will be taught by an ECE faculty in front of students. All assignment

submissions and other course management actions can take place in Canvas. Faculty-student interaction is available via email, phone, in-person meetings, and Zoom-interface meetings.

Faculty members who teach in the web-based format are experienced and can be assisted by ODU's Division of Distance Learning and the Center for Faculty Development. If necessary, instructors can be trained to become effective instructors and to develop their courses for online and on campus delivery.

To this end, ODU has made significant investments in the creation of state-of-the-art infrastructure and laboratories for students to conduct research and project, including

1. Applied Plasma Technology Laboratory (APTL)
2. CAVE Automated Virtual Environment (CAVE)
3. Collaborative Autonomous Systems Laboratory
4. Cybersecurity, Communications & Networking Innovation (CCNI) Laboratory
5. Gene Therapy and Regenerative Medicine Laboratory
6. Machine Intelligence & HR Communications Laboratory
7. Medical Simulations Laboratory
8. Plasma Engineering & Medicine Institute (PEMI)
9. Systems Research Laboratory
10. Virginia Institute for Photovoltaics (VIPV)
11. Vision Lab
12. Virginia Institute for Vision Analysis (VIVA)

In addition, the department has several faculty members with research labs at the Applied Research Center (ARC) at the Jefferson National Laboratory, at the Frank Reidy Center for Bioelectronics, at the Center for Bioelectronics and at the Virginia Modeling, Analysis, and Simulation Center (VMASC).

D. Admission Criteria

All students applying to graduate degrees at Old Dominion University will meet criteria established by the Graduate School. General criteria for acceptance into the PH.D. Ph.D. in ECE degree include the following:

- Online graduate application and application fee
- A bachelor's degree from a regionally-accredited university in the U.S. or an accredited foreign institution
- Official copies of transcripts of all regionally-accredited colleges and universities attended

- Two letters of recommendation from individuals familiar with the applicant's professional and/or academic background
- A current resume
- A statement of professional goals
- GRE scores
- Current scores on the Test of English as a Foreign Language (TOEFL) with a minimum of 230 on the computer-based TOEFL or 80 on the TOEFL iBT, if the applicant's native language is not English.

Applicants to a Ph.D. in ECE degree are expected to have completed a master's degree in electrical engineering and/or computer engineering or a closely related technical field with a minimum grade point average of 3.5 (on a 4.0 scale) in graduate course work. The applications are submitted through the Office of Admissions of Old Dominion University. The Frank Batten College of Engineering and Technology at Old Dominion University has the Direct Bachelor-to-Ph.D. and Integrated Bachelor/Ph.D. programs that allow exceptionally well-qualified undergraduate students to apply for admission directly to a Ph.D. program.

Accepted students from disciplines other than ECE are required to complete a number of leveling courses to meet prerequisites for graduate studies. All students are required to have one year of college chemistry and one year of calculus-based college physics in addition to Calculus III and Differential Equations courses. Students at Old Dominion University may complete the leveling requirement by earning a minor in electrical or computer engineering with a GPA of 3.0 or greater. Students that have not earned a minor need to meet with the graduate program director to prepare a course plan and determine which pre-requisite courses are needed. In general, three to four leveling courses are needed and they are chosen from the following lists.

List of Possible Courses to Meet the Leveling Requirement

ECE 202	Circuit Analysis II	3 Credits
ECE 241	Fundamentals of Computer Engineering	4 Credits
ECE 302	Linear System Analysis	3 Credits
ECE 303	Introduction to Electrical Power	3 Credits
ECE 304	Probability, Statistics, and Reliability	3 Credits
ECE 313	Electronic Circuits	4 Credits
ECE 323	Electromagnetics	3 Credits
ECE 332	Microelectronic Materials and Processes	3 Credits
ECE 341	Digital System Design	3 Credits
ECE 346	Microcontrollers	3 Credits
ECE 381	Introduction to Discrete-time Signal Processing	3 Credits

E. Curriculum

Curriculum for Students Admitted with a M.S. Degree

Core courses - 7 credit hours
ECE 651 Statistical Analysis and Simulation (3 cr)
ECE 831 Graduate Seminar **(**1 cr)
ECE 861 Computational and Statistical Methods in Electrical and Computer Engineering (3 cr)

Electives (Graduate-level course work) - 18 credit hours
For students with a master's degree, the 18 credit hours of elective graduate-level coursework consist of six 3-credit graduate-level courses chosen by the student and the research advisor and approved by the Graduate Program Director. A minimum of four of the six courses must be completed at the 800 level, and no more than 9 credits can be taken in other departments.

Research Requirement - 24 credit hours
Students will repeat this course, as needed, until the minimum credit hours are fulfilled.
ECE 899 Dissertation Research (1-9 cr)

Additional requirements
Students are required to successfully complete a written diagnostic examination, written and oral candidacy examinations, dissertation research proposal, and to write and defend in public their dissertation.

Total credit hours: 49 credit hours

Curriculum for Students Admitted with a B.S. Degree

Core courses: 22 credit hours
ECE 558 Instrumentation (3 cr)
ECE 561 Automatic Control Systems (3 cr)
ECE 601 Linear Systems (3 cr)
ECE 611 Numerical Methods in Engineering Analysis **(**3 cr)
ECE 612 Digital Signal Processing I **(**3 cr**)**
ECE 651 Statistical Analysis and Simulation (3 cr)
ECE 831 Graduate Seminar (1 cr)
ECE 861 Computational and Statistical Methods in Electrical and Computer Engineering (3 cr)

Electives (Graduate-level course work) – 27 credit hours
For students without a master's degree, the 27 credit hours of elective graduate-level coursework consist of nine 3-credit graduate-level courses chosen by the student and the research advisor and approved by the Graduate Program Director.

Research Requirement – 30 credit hours
Students will repeat this course, as needed, until the minimum credit hours are fulfilled.

ECE 899 Dissertation Research (1-9 cr)

Additional requirements
Students are required to successfully complete a written diagnostic examination, written and oral candidacy examinations, dissertation research proposal, and to write and defend in public their dissertation.

Total Credits: 79 credit hours

For all Ph.D. students without MS degree, they are required to take the department's Ph.D. Diagnostic Examination for the first time before the end of their fourth semester or completing the 36 credit hours of graduate courses. For all Ph.D. students with MS degree, they are required to take the department's Ph.D. Diagnostic Examination for the first time before the end of their second semester or completing the 18 credit hours of graduate courses. The examination is offered every fall and spring semester, and the student needs to pass the examination in no more than two attempts. The second attempt, if necessary, should be taken at the next offered examination. The topics for the examination and samples of previous examinations are posted in the department's website. The examination rules are given on the first page of each examination.

In consultation with the advisory committee, the student will prepare a candidacy exam for presentation to and approval by the committee. The candidacy exam includes three portions, written report, oral presentation, and dissertation prospectus. It is required that the candidacy examination be taken in the semester when a student is completing the graduate coursework or during the following semester. After passing the candidacy exam, the chair of the advisory committee shall recommend the student's admission to candidacy to the Graduate Program Director. It is a university requirement that students who have advanced to candidacy be enrolled for at least one credit hour every fall, spring, and summer until graduation. Upon completion of the dissertation, the student's dissertation committee will conduct a public examination and defense of the dissertation. For both advisory and dissertation committees, the chair has to be a full time ECE faculty member as well as a minimum of 2 full time ECE faculty members and 1 outside ECE member are required.

Appendix A provides sample schedules for full-time and part-time students. Course descriptions may be found in Appendix B.

F. Time to Degree

A full time student will be able to complete the Ph.D. in ECE in 5 years in the average. Students who wish to do so will complete 25 credits graduate courses, pass the diagnostic exam, and advance to the candidate status within 2.5 years including summer semester on average. Part-time students will complete the degree in approximately 7-8 years depending on the time each student can dedicate.

G. Faculty Resources

Twenty-seven faculty members holding tenure-track or tenured positions in the department of Electrical and Computer Engineering have credentials to serve as the committee chair in the dissertation committee. Ph.D. students can also take graduate courses outside ECE. The none-ECE courses are taken in : College of Sciences (Computer Science; Mathematics & Statistics; Physics; Biological Sciences) and the Batten College of Engineering and Technology (Mechanical & Aerospace Engineering; Engineering Management and Systems Engineering).

The faculty have breadth and depth in areas of electrical and computer engineering, ranging from system to physical electronics, from power to renewable energy, and from fundamental signal processing to modeling, simulation, cybersecurity engineering. Combined, they have an extensive record of scholarship. During the past three years they disseminated over 230 peer-reviewed journal publications and over 150 peer-reviewed conference papers in electrical and computer fields. The ECE department has been ranked in the top 30 percent nationally by the National Science Foundation for research expenditures. Faculty members serving as Principal Investigators currently have 145 active research grants that have been awarded over $28,000,000 from prestigious organizations such as the National Science Foundation, Department of Homeland Security, Department of Defense, National Security Agency, Air Force Research Laboratory, and Department of Energy.

Abbreviated CVs for existing full-time faculty members can be found in Appendix C.

H. Student Learning Assessment

The goal of this graduate level, Ph.D. program is to prepare its graduates to establish themselves as leaders in high-level engineering positions in industry or a government setting - by conducting themselves in a responsible, professional, and ethical manner.

Ph.D. students will be evaluated throughout the program using formative assessments, such as, tests, diagnostics exam, candidacy exam, papers, dissertation, and presentations. Student learning outcomes cover many of the technical and management competencies that are required for the area of electrical and computer engineering. Specifically,:

- The program will produce graduates with an advanced technical understanding and skills in electrical and computer engineering.
- Program graduates will be able to apply advanced knowledge and skills in electrical and computer engineering to solve contemporary problems of industry and society.
- Program graduates will be able to conduct both independent and collaborative research to generate new knowledge in the field of electrical and computer engineering.
- Program graduates will effectively communicate knowledge to the technical and broader public communities.

Ph.D. students' learning outcomes assessment approach:

Outcomes	Ph.D. Students
1. Advanced Knowledge: Graduates will be able to apply new electrical and computer engineering knowledge to their chosen area of expertise in (1) systems, (2) signal and image processing, (3) physical electronics or (4) computer engineering. Graduates should become experts in their field of knowledge and research.	a. Diagnostic Exam: The graduate committee will assess this outcome based on performance on the diagnostic examination b. Candidacy exam: The student's Advisory Committee will assess the applicable outcomes based on the candidacy exam and determine the student's ability by using the "rubrics" developed for this outcome. c. Dissertation (ECE 899): The student's Dissertation Committee will assess the applicable outcomes based on the Ph.D. Dissertation and determine the student's ability by using the "rubrics" developed for this outcome.
2. Independent Research: Graduates will be able to conduct and critique high-level independent research in the field of electrical and computer engineering.	Dissertation (ECE 899): The student's Dissertation Committee will assess the applicable outcomes based on the Ph.D. Dissertation and determine the student's ability by using the "rubrics" developed for this outcome.
3. Original Contribution: Graduates will be able to create and produce an "original contribution to knowledge" in the field of electrical and computer engineering.	This outcome is evaluated on the following criteria as judged by the Dissertation Committee. Inadequate: the original contribution through the dissertation research is not publishable in a refereed journal. Adequate: the original contribution is publishable in a refereed journal. Excellent: the original contribution is publishable and can produce at least one article in a reputable journal in the field.
4. Written Communication Skills: Graduates will be able to evaluate scholarly electrical and computer engineering ideas and advanced technical material such as mathematical equations and data analysis in writing prepared for peer-reviewed academic journal articles.	Dissertation (ECE 899): Graduates will be able to evaluate scholarly electrical and computer engineering ideas and advanced technical material such as mathematical equations and data analysis in writing prepared for peer-reviewed academic journal articles. The student's Dissertation

	Committee will assess the applicable outcomes based on the Ph.D. Ph.D. Dissertation and determine the student's ability by using the "rubrics" developed for this outcome
5. Verbal Communication Skills: Graduates will be able to create electrical and computer engineering research questions, recommend appropriate methodologies, and justify related results both verbally and visually in an academic presentation.	Dissertation (ECE 899): Graduates will be able to create electrical and computer engineering research questions, recommend appropriate methodologies, and justify related results both verbally and visually in an academic presentation. The students' Dissertation Committee will assess the applicable outcomes based upon the student's presentation and ability to answer questions during the defense examination. The Committee will determine the student's ability by using the "rubrics" developed for this outcome

Appendix shows rubric to evaluate those outcomes and the diagnostic exam (Ph.D.) guidelines.

I. Employment Skills

The Ph.D. program in Electrical and Computer Engineering will provide a continuously improving learning environment to its students while maintaining high ethical, multicultural, and global standards. The Ph.D. degree is awarded to candidates who have displayed an in-depth understanding of the subject matter and demonstrated the ability to make an original contribution to knowledge in their chosen field of specialty. Ph.D. degree students must take eight courses beyond their Master's degree, five of which must be at the doctoral 800 level. Ph.D. students must also pass diagnostic and candidacy exams, work on advanced research under direct advising of an ECE faculty member and write and defend an original dissertation. The first main goal of this Ph.D. program is to prepare its graduates so they will be able to establish themselves as leaders in high-level engineering positions in industry and/or a government setting. Ph.D. graduates are employed as electrical and computer engineers supporting industries like automotive, manufacturing, systems integration, shipbuilding, aerospace, defense, telecommunications, etc. They are also employed as researchers by private research and development labs or by federally funded organizations (Jefferson Lab, NASA, or the Naval Research Laboratories). Some of our former doctoral students have also gone into academic careers doing postdoctoral fellowships or are working in universities as faculty members. The second goal of this Ph.D. program is to prepare its graduates so they will be able to continue to create engineering knowledge. The third goal of Ph.D. program is to prepare its graduates and encourage them to establish themselves as successful faculty members if they choose to join academia.

Graduates of the proposed Ph. D. in ECE will have the skills and abilities needed for employment and workplace competencies in the field of electrical and computer engineering. Specifically, they will have the ability to:

- Graduates will have the ability to discover or develop new engineering knowledge and scholarly skills at an advanced level.
- Graduates will be able analyze advanced, complex electrical and computer engineering problems and develop practical solutions that work within provided specifications and constraints.
- Graduates will develop critical thinking skills and competencies in technical aspects of electrical and computer engineering in current and emerging electrical and computer technologies.
- Graduates will apply leading-edge principles, theories, and concepts to the development of standards, procedures, and guidelines in their chosen field of specialty related to electrical and computer engineering.
- Graduates will work effectively as a member of a team and be able to lead others in teamwork-based projects.
- Graduates will be able to communicate effectively in written, oral, and other modes as needed

J. Relationship to Existing Programs

The existing program at ODU is a Ph.D. in General Engineering with a concentration in Electrical and Computer Engineering. The proposed program is not an expansion of an existing program. The proposed program is a standalone program with a new focus in Electrical and Computer Engineering. No degree programs will be compromised or closed as a result of the initiation and operation of the proposed degree program.

Part II: Justification for the Proposed Program

A. Response to Current Needs (Specific Demand)

The Electrical and Computer Engineering CIP Code 14.4701 was introduced in 2020. Since 2020, 35 institutions have adopted the new CIP code. For example, the Rochester Institute of Technology and the University of Michigan adopted the new CIP code and started offering doctoral degrees in electrical and computer engineering. ODU would be the first university in Virginia to offer graduate degrees in electrical and computer engineering to meet current and future needs.

Shortage of Qualified Electrical and Computer Engineers for New Market Opportunities and Global Competitiveness Advanced Technology in USA

According to the U.S. Bureau of Labor Statistics (BLS), two occupations long associated with innovation – electrical and electronics engineering – have all but stalled in their growth. The slow rate of growth in most manufacturing sectors is getting much of the blame for the stall in this occupation. This bleak view of the field is in direct contrast with industry claims that the United States has a massive shortage of skilled electrical engineers. American companies maintain that this is not an issue of declining demand, but rather one of declining investment in U.S. workers in favor of lobbying Congress for access to inexpensive foreign labor. Some observers claim that the demand for American electrical engineers would improve if the U.S. insisted that rockets that launch astronauts, satellites, weather, and GPS equipment were made in the U.S. The BLS predicts that most opportunities for electrical and electronics engineers will be with engineering service firms, as companies seek to reduce costs by contracting. Electrical engineers familiar with developing technologies in the areas of solar arrays, semiconductors, and communications will be best positioned to find jobs[1].

According to a CNBC report[2], the software developer (one field of computer engineering) shortage will be alarming in 2022. According to the U.S. Bureau of Labor Statistics (BLS)[3], by 2030, the number of software job vacancies would rise by almost 22%. The average growth rate of software developers in the USA is only 8% right now, and that clearly emphasizes there is already an overwhelming and severe shortage of skilled workers. The talent shortfall starts with college graduates and advanced professionals in the fields of science, technology, engineering and mathematics (STEM). While a shortage of STEM workers will not stop a company's day-to-day operations, it can hamper the pace of growth for the whole industry and, subsequently, have an impact on the competitiveness of entire countries or regions[4].

The doctoral program prepares students for academia, research laboratories, and industry careers. In 2023, universities in the state of Virginia posted positions for tenure-track and research faculty, including positions seeking expertise in cyber-physical systems (Hampton University), integrated microsystems design and fabrication (Virginia Tech), and statistical estimation, signal processing, and wireless communications (University of Virginia). With their unique electrical and computer engineering foundation, our doctoral students can succeed in these positions by integrating their expertise in electrical engineering and computer systems. The federal government (e.g., U.S. Army Corps of Engineers, Fort Belvoir) and industry (e.g., Amentum, Dahlgren) have positions for applicants with a Ph.D. degree who can design and develop systems at the crossroads of electrical and computer engineering. Graduates of our Ph.D. in Electrical and Computer Engineering will be needed to ensure that the Virginia Clean Economy Act will deliver practical and innovative solutions while spurring economic growth.

[1]The job market for electrical engineers in the United states, CareerExplorer, http://www.careerexplorer.com/careers/electrical-engineer/job-market/#whats-the-supply.
[2]The US has nearly 1 million open IT jobs—here's how much it can pay off to switch industries into tech, CNBC, http://www.cnbc.com/2019/11/06/how-switching-careers-to-tech-could-solve-the-us-talent-shortage.html.
[3]Computer Programmers, U.S. Bureau of Labor Statistics, http:// www.bls.gov/ooh/computer-and-information-technology/computer-programmers.htm.
[4]Engineering Talent Shortage Now Top Risk Factor, Semiconductor Engineering. http:// Engineering Talent Shortage Now Top Risk Factor (semiengineering.com)

B. Employment Demand

The proposed PH.D. in ECE responds to the need for electrical and computer professionals in the Commonwealth of Virginia, the nation, and the world. In recent U.S. Bureau of Statistics, employment of computer and information research scientists is projected to grow 20 percent from 2020 to 2030, much faster than the average for all occupations[1]. About 9,700 openings for computer programmers are projected each year, on average, over the decade[2]. Overall employment of electrical and electronics engineers is projected to grow 7 percent from 2020 to 2030, about as fast as the average for all occupations[3]. "There are more computers on the manufacturing floor than machine tools and other types of equipment," said Judy Marks, CEO of Siemens USA[4]. More and more factory jobs now demand education, technical know-how or specialized skills. And many of the workers set adrift from low-tech factories lack such qualifications[4]. In addition, although computer and information research scientists typically need a master's or higher degree in computer related field, such as electrical and computer engineering, employers prefer to hire candidates who have a Ph.D[5]. Focusing on cutting edge education and training will be essential for Virginia's and U.S. high technology workforce and economic development as occupations in the electrical and computer industry are highly in demand and among the fastest growing in the economy. The proposed degree program will contribute to addressing such needs by preparing students to understand electrical and computer

engineering principles and develop more innovative and advanced systems. Graduates will become the next generation in the high technology workforce to safeguard U.S. the leadership in technology.

[1] Computer and Information Research Scientists, U.S. Bureau of Labor Statistics, http:// www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm.
[2] Computer Programmers, U.S. Bureau of Labor Statistics, http:// www.bls.gov/ooh/computer-and-information-technology/computer-programmers.htm.
[3] Electrical and Electronics Engineers, U.S. Bureau of Labor Statistics, http;// www.bls.gov/ooh/architecture-and-engineering/electrical-and-electronics-engineers.htm.
[4] Lots of High-Tech factory Jobs in U.S., but Skilled Workers Are lacking, The Seattle Times, http:// www.seattletimes.com/business/high-tech-us-plants-offer-jobs-even-as-the-laid-off-struggle/
[5] U. S. Bureau of Labor Statistics, http://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm#tab-4

Labor Market Information: Bureau of Labor Statistics, 2021 -2031 (10-Yr)

Occupation	Base Year Employment	Projected Employment	Total % Change and #s	Typical Entry Level Education
Electrical and Electronics Engineer	303,800	313,600	3%, 9,800	Bachelor's
Computer hardware engineer	76,900	80,600	5%, 3,700	Bachelor's
Computer and information research scientist	33,500	40,600	21%, 7,100	Master's
Computer network architects	174,800	182,300	4%, 7500	Bachelor's
Computer systems analyst	538,800	589,700	9%, 50,900	Bachelor's

Labor Market Information: Virginia Employment Commission, 2020 -2030 (10-Yr)

Occupation	Base Year Employment	Projected Employment	Total % Change and #s	Annual Change #	Education
Electrical Engineer	6155	6666	8.3%, 511	51	Bachelor's
Electronics Engineers, Except Computer	3981	4234	6.3%, 253	25	Bachelor's
Computer and Information Systems Managers	15422	17107	10.9%, 1685	168	Bachelor's
Computer Science Teachers, Postsecondary	1668	1843	10.4%, 175	18	Not applicable

C. Student Demand

Our draft student demand survey is attached as Appendix H which will be sent out to ODU ECE majors with Junior, Senior, and MS standing (i.e., those likely already thinking about potential graduate programs) and students outside ODU. SCHEV requires these surveys be conducted within twelve (12) months of submitting the proposal to SCHEV, so we are waiting for the final timeline to be established prior to initiating these efforts.

D. Duplication

No university in the Commonwealth of Virginia offers a Ph.D. degree in Electrical and Computer Engineering. The following tables provide data for similar but not equivalent degrees.

Ph.D. degree:

Engineering, General (CIP Code: 14.0101)				
Institution	Degree	Program Name	Enrollment	Degrees Awards
Virginia Commonwealth University	Ph.D	Engineering	Fall 2021: 57 Fall 2020: 76 Fall 2019: 89 Fall 2018: 86 Fall 2017: 83	Year 2021: 8 Year 2020: 11 Year 2019: 16 Year 2018: 15 Year 2017: 15
Old Dominion University	Ph.D.	Engineering	Fall 2021: 234 Fall 2020: 218 Fall 2019: 233 Fall 2018: 230	Year 2021: 23 Year 2020: 34 Year 2019: 39 Year 2018: 34

			Fall 2017: 243	Year 2017: 33

Electrical and Electronics Engineering (CIP Code: 14.1001)				
Institution	Degree	Program Name	Enrollment	Degrees Awards
George Mason University	Ph.D.	Electrical and Computer Engineering	Fall 2021: 69 Fall 2020: 69 Fall 2019: 65 Fall 2018: 65 Fall 2017: 65	Year 2021: 6 Year 2020: 5 Year 2019: 5 Year 2018: 13 Year 2017: 10
University of Virginia	Ph.D.	Electrical Engineering	Fall 2021: 103 Fall 2020: 112 Fall 2019: 113 Fall 2018: 110 Fall 2017: 102	Year 2021: 15 Year 2020: 17 Year 2019: 15 Year 2018: 15 Year 2017: 10
Virginia Tech	Ph.D	Electrical Engineering	Fall 2021: 220 Fall 2020: 230 Fall 2019: 252 Fall 2018: 241 Fall 2017: 248	Year 2021: 43 Year 2020: 35 Year 2019: 36 Year 2018: 42 Year 2017: 38

Computer Engineering, General (CIP Code: 14.0901)				
Institution	Degree	Program Name	Enrollment	Degrees Awards
University of Virginia	Ph.D.	Computer Engineering	Fall 2021: 44 Fall 2020: 45 Fall 2019: 42 Fall 2018: 34 Fall 2017: 26	Year 2021: 2 Year 2020: 3 Year 2019: 3 Year 2018: 3 Year 2017: 2
Virginia Tech	Ph.D	Computer Engineering	Fall 2021: 75 Fall 2020: 69 Fall 2019: 65 Fall 2018: 65 Fall 2017: 76	Year 2021: 9 Year 2020: 11 Year 2019: 9 Year 2018: 15 Year 2017: 14

Virginia Commonwealth University (VCU)

Similarities to ODU

1. The degree is designated as general engineering with a concentration in electrical and computer engineering.
2. It covers disciplines related to electrical and computer engineering.
3. It provides two paths, including students with B.S only and students with B.S. & M.S., to

pursue Ph.D.
4. It has diagnostic exam, named qualifier exam, and dissertation proposal and defense.

Differences from ODU

1. For students with B.S., it only requires 60 credits, including 33 credits course works (12 credits for concentration component and 21 credits for option electives) and 27 credits dissertation research. It does not require additional 1 credit graduate seminar.
2. For students with B.S. & M.S., it only requires 30 credits, including 9 credits course works (6 credits for concentration component and 3 credits for option electives) and 21 credits dissertation research. It does not require additional 1 credit graduate seminar.
3. For both paths, it does not require additional candidacy exam to advance candidacy. Instead, it uses dissertation proposal as an assessment to determine the candidacy status.
4. It requires peer-reviewed evidence of the quality of the dissertation work, in terms of at least one accepted or published reputable journal paper or published high-quality conference paper and a second manuscript submitted to a journal or a high-quality conference, must be approved by the doctoral advisory committee and the ECE graduate program director before the dissertation defense can be scheduled. These publications should be based on the student's dissertation research, with the student as the primary author.

George Mason University (GMU)

Similarities to ODU

1. It covers disciplines related to electrical and computer engineering.
2. It provides two paths, including students with B.S only (72 credits) and students with B.S. & M.S. (42 credits), to pursue Ph.D.
3. It has diagnostic exam, named qualifier exam, and dissertation proposal and defense.

Differences from ODU

1. It does not require additional 1 credit graduate seminar but requires students to present at least one ECE departmental seminar on the topic of their dissertation research.
2. It does not have the candidacy exam to determine the candidacy status. It uses dissertation proposal determine the candidacy status.
3. It requires each Ph.D. student is required to participate in the department's teaching activity. The requirement is typically satisfied by working as a recitation instructor for one semester, presenting several lectures within a course, or performing other teaching work approved by the department.

Virginia Tech (VT)

Similarities to ODU

It covers disciplines related to electrical and computer engineering.

Differences from ODU

1. It must have M.S. degree.
2. It has diagnostic exam, named qualifier exam, and needs complete a minimum of 92 credit hours, consisting of 30 course-credit hours, 60 credit hours of research and dissertation, and 2 course-credit-hours of Seminar. The Seminar requirement is waived for students who earn a master's degree in ECE at Virginia Tech. In addition to completing a dissertation and passing an oral defense of the dissertation, candidates must successfully meet two examination requirements, a Ph.D. Qualifying Examination and a Ph.D. Preliminary Examination
3. This qualifying exam has oral and written components, and serves as a departmental filter to assess the student's broad background in ECE, verbal and writing abilities, and the potential for successfully completing doctoral work.
4. This preliminary exam is an oral exam, before the student's advisory committee that determines the student's ability to develop scholarly research. The student presents the results of his or her current research investigations along with an outline of a proposed Ph.D. dissertation. The examination committee may also ask questions on course work and related topics, including possible written, open-ended questions prior to the oral exam

University of Virginia (UVA)

Similarities to ODU

1. It covers disciplines related to electrical and computer engineering.
2. It provides two paths, including students with B.S only (73 credits) and students with B.S. & M.S. (49 credits), to pursue Ph.D.
3. It has the graduate seminar requirement.
4. Its qualifying exam includes our diagnostic and candidacy exams.

Differences from ODU

It requires 3 credits supervised teaching.

Part III: Summary of Projected Enrollments in Proposed Program

Projected enrollment:

Year 1		Year 2		Year 3		Year 4			Year 5		
2025-2026		**2026-2027**		**2027-2028**		**2028-2029**			**2029-2030**		
HDCT	FTES	HDCT	FTES	HDCT	FTES	HDCT	FTES	GRAD	HDCT	FTES	GRAD
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Assumptions:
Retention percentage: 80%
Part-time students: 20%; Full-time students: 80%
Expected time to graduation for full-time: 5 years; and part-time: 7 years
Number of credit hours per semester for full-time: 9; and for part-time: 3-6

Part IV: Projected Resource Needs for the Proposed Program

Resource Needs

Old Dominion University

Full-Time Faculty

Twenty-seven full-time faculty members who are either tenured or on a tenure track will teach the core course curriculum in the Ph.D. in Electrical and Computer Engineering program, with and Two lecturers teaching associated electives for a total of twenty-nine full-time program faculty.

Part-Time Faculty

No part-time faculty members are required to launch and sustain the proposed program.

Adjunct Faculty

No adjunct faculty members are required to initiate and sustain the proposed program.

Graduate Assistants

No graduate assistants are required to initiate and sustain the proposed program.

Classified Positions

No classified position is requested to initiate and sustain the proposed program.

Targeted Financial Aid

No targeted financial aid is required to launch and sustain the proposed program.

Library

No new library resources are required to launch and sustain the proposed program. The University Libraries has a strong collection in the Electrical and Computer Engineering. Many current journals are found in the online databases, and the library has a responsive interlibrary loan program for resources outside of the current collection. The Department of Electrical and Computer Engineering has an annual allowance for books or journals.

Telecommunications

No new telecommunication resources are needed to initiate and sustain the proposed program.

Equipment (including computers)

No new equipment resources are needed to initiate and sustain this proposed program.

Space

No additional space is needed to initiate and sustain this proposed program.

Other Resources (specify)

No new resources will be required to launch or operate the proposed Ph.D. in Electrical and Computer Engineering.

Funds to Initiate and Operate the Degree Program

Cost and Funding Sources to Initiate and Operate the Program

	Informational Category	Program Initiation Year 2025-2026	Program Full Enrollment Year 2028-2029
1	Projected Enrollment (Headcount)	50	68
2	Projected Enrollment (FTE)	45	61
3	Projected Enrollment Headcount of In- State Students	$16,369 (in-state) $38,595 (out-of-state)	$18,949 (in-state) $44,679 (out-of-state)
4	Projected Enrollment Headcount of Out- of-State Students	$929,580	$1,468,642
5	Estimated Annual Tuition and E&G Fees for In-state Students in the Proposed Program		
6	Estimated Annual Tuition and E&G Fees for Out-of-State Students in the Proposed Program		
7	Projected Total Revenue from Tuition and E&G Fees Due to the Proposed Program		
8	Other Funding Sources Dedicated to the Proposed Program (e.g., grant, business entity, private sources)	$0.00	$0.00

Resource Needs: Parts A - D

Part A: Answer the following questions about general budget information.

- Has or will the institution submit an addendum budget request to cover one-time costs? Yes _____ No X
- Has or will the institution submit an addendum budget request to cover operating costs? Yes No X

- Will there be any operating budget requests for this program that would exceed normal operating budget guidelines (for example, unusual faculty mix, faculty salaries, or resources)? Yes _____ No X
- Will each type of space for the proposed program be within projected guidelines? Yes X No _____
- Will a capital outlay request in support of this program be forthcoming? Yes _____ No X

Part D: Certification Statement(s)

The institution will require additional state funding to initiate and sustain this program.

_____ Yes _____
Signature of Chief Academic Officer

X No _____
Signature of Chief Academic Officer

Secondary Certification.

If resources are reallocated from another unit to support this proposal, the institution will **not** subsequently request additional state funding to restore those resources for their original purpose.

X Agree _____
Signature of Chief Academic Officer

_____ Disagree _____
Signature of Chief Academic Officer

APPENDIX A – SAMPLE PLAN OF STUDY

Sample plan of student for full-time student with a prior MS

Course	Credits	Category
Fall I		
ECE 651 Statistical Analysis and Simulation	3	Core
ECE 861 Computational and Statistical Methods in Electrical and Computer Engineering	3	Core
Elective Courses	3	Elective
TOTAL 9 credits		
Spring I		
Elective Courses	3	Elective
Elective Courses	3	Elective
Elective Courses	3	Electives
TOTAL 9 credits		
Fall II		
Elective Courses	3	Elective
Elective Courses	3	Elective
ECE 831 Graduate Seminar	1	Core
ECE 899 Dissertation	2	Core
TOTAL 9 credits		
Spring II		
ECE 899 Dissertation	9	Core
TOTAL 9 credits all But ABD status		
Summer II		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Fall III		
ECE 800 Dissertation	6	core
TOTAL 6 credit all But ABD status		
Spring III		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Summer III		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Fall IV		
ECE 899 Dissertation	2	Core
TOTAL 1 credit all But ABD status		

Spring IV		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Summer IV		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		

Total required for degree - 49 credits

Sample plan of student for part-time student with a prior MS

Course	Credits	Category
Fall I		
ECE 651 Statistical Analysis and Simulation	3	Core
ECE 861 Computational and Statistical Methods in Electrical and Computer Engineering	3	Core
TOTAL 6 credits		
Spring I		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Fall II		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Spring II		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Fall III		
ECE 800 Dissertation	5	core
ECE 831 Graduate Seminar	1	core
TOTAL 6 credits		
Spring III		
ECE 899 Dissertation	6	Core
TOTAL 6 credits all But ABD Status		
Summer III		
ECE 899 Dissertation	6	Core
TOTAL 6 credit all But ABD status		
Fall IV		

ECE 899 Dissertation	2	Core
TOTAL 1 credit all But ABD status		
Spring IV		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Summer IV		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Fall V		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Spring V		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Summer V		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		

Total required for degree - 49 credits

Sample plan of student for full-time student with no prior MS

Course	**Credits**	**Category**
Fall I		
ECE 558 Instrumentation	3	Core
ECE 561 Automatic Control Systems	3	Core
ECE 601 Linear Systems	3	Core
TOTAL 9 credits		
Spring I		
ECE 611 Numerical Methods in Engineering Analysis	3	Core
ECE 612 Digital Signal Processing I	3	Core
ECE 651 Statistical Analysis and Simulation	3	Core
TOTAL 9 credits		
Fall II		
ECE 861 Computational and Statistical Methods in Electrical and Computer Engineering	3	Core
Elective Courses	3	Elective
Elective Courses	3	Elective

TOTAL 9 credits		
Spring II		
Elective Courses	3	Elective
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 9 credits		
Fall III		
Elective Courses	3	Elective
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 9 credits		
Spring III		
ECE 831 Graduate Seminar	1	Core
ECE 899 Dissertation	5	Core
Elective Courses	3	Elective
TOTAL 9 credits		
Summer III		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Fall IV		
ECE 899 Dissertation	9	Core
TOTAL 9 credits		
Spring IV		
ECE 899 Dissertation	9	Core
TOTAL 1 credit all But ABD status		
Summer IV		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Fall V		
ECE 899 Dissertation	4	Core
TOTAL 1 credit all But ABD status		
Spring V		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		

Total required for degree - 79 credits

Sample plan of student for part-time student with no prior MS

Course	Credits	Category
Fall I		
ECE 558 Instrumentation	3	Core
ECE 561 Automatic Control Systems	3	Core
TOTAL 6 credits		
Spring I		
ECE 611 Numerical Methods in Engineering Analysis	3	Core
ECE 601 Linear Systems	3	Core
TOTAL 6 credits		
Fall II		
ECE 651 Statistical Analysis and Simulation	3	Core
ECE 612 Digital Signal Processing I	3	Core
TOTAL 6 credits		
Spring II		
ECE 861 Computational and Statistical Methods in Electrical and Computer Engineering	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Fall III		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Spring III		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Fall IV		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Spring IV		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Fall V		
ECE 899 Dissertation	5	Core

ECE 831 Graduate Seminar	1	Core
TOTAL 6 credits		
Spring V		
ECE 899 Dissertation	6	Core
TOTAL 6 credit all But ABD status		
Summer V		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Fall VI		
ECE 899 Dissertation	6	Core
TOTAL 6 credits all But ABD status		
Spring VI		
ECE 899 Dissertation	6	Core
TOTAL 6 credits all But ABD status		
Summer VI		
ECE 899 Dissertation	1	Core
TOTAL 1 credit all But ABD status		
Fall VII		
ECE 899 Dissertation	4	Core
TOTAL 1 credit all But ABD status		

Total required for degree - 79 credits

APPENDIX B - COURSE DESCRIPTIONS

Core Courses:

ECE 558 Instrumentation (3 Credit Hours)
Computer interfacing using a graphical programming language with applications involving digital-to-analog conversion (DAC), analog-to-digital conversion (ADC), digital input output (DIO), Virtual Instrument System Architecture (VISA) and universal Service Bus (USB). Analysis of sampled data involving use of probability density function, mean and standard derivations, correlations, and the power spectrum.

ECE 561 Automatic Control Systems (3 Credit Hours)
Analysis and design of control systems as found in automobiles and aircraft, autonomous vehicles, robots, and many other engineering systems. Time and frequency domain techniques such as root locus, Bode, Nyquist and state space techniques are utilized together with computer-aided analysis and design.

ECE 601 Linear Systems (3 Credit Hours)
A comprehensive introduction to the analysis of linear dynamical systems from an input-output and state space point of view. Concepts from linear algebra, numerical linear algebra and linear operator theory are used throughout. Some elements of state feedback design and state estimation are also covered.

ECE 611 Numerical Methods in Engineering Analysis (3 Credit Hours)
Course intended to provide graduate students in Electrical and Computer Engineering with a basic knowledge of numerical methods applied to engineering problem-solving process. The course includes the following topics: Introduction to computing (Matlab), Truncation errors and Taylor series, Numerical integration, Solution of non-linear equations, Least-Square regression, Interpolations, Ordinary and partial differential equations, and Finite difference methods. Applications to the area of electrical engineering.

ECE 612 Digital Signal Processing I (3 Credit Hours)
This course will present the fundamentals of digital signal processing. Topics will include frequency domain analysis of discrete-time linear systems, sampling and reconstruction of signals, the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), and digital filter design and implementations. Practical applications and examples will be discussed. Problem solving using MATLAB is required.

ECE 651 Statistical Analysis and Simulation (3 Credit Hours)
An introduction to probabilistic and statistical techniques for analysis of signals and systems. This includes a review of probability spaces, random variables, and random processes. Analysis and simulation of systems with random parameters and stochastic inputs are considered.

ECE 861 Computational and Statistical Methods in Electrical and Computer Engineering **(3 Credit Hours)**
This course covers the theoretical foundation and application of commonly used techniques in Computational and statistical methods. Topics include linear algebra, partial differential equations, regression analysis, applied probabilities, multivariate distributions, Bayesian statistics, hypothesis tests, multiple comparisons, ANOVA, solution of non-linear equations, numerical methods and optimization. Programming software will be used to perform simulations and analyze a variety of data.

ECE 831 Graduate Seminar (1 Credit Hour)

Graduate seminar presentations concerning technical topics of current interest given by faculty and invited speakers.

ECE 899 Dissertation Research (1-9 Credit Hours)
Directed research for the doctoral dissertation.

Elective Courses

ECE 607 Machine Learning I (3 Credit Hours)
Course provides a practical treatment of design, analysis, implementation and applications of algorithms. Topics include multiple machine learning models: linear models, neural networks, support vector machines, instance-based learning, Bayesian learning, genetic algorithms, ensemble learning, reinforcement learning, unsupervised learning, etc.

ECE 623 Electromagnetism (3 Credit Hours)
Review of electrostatic and magnetostatic concepts, time varying field, Maxwell's equations, plane wave propagation in various media, transmission lines, optical wave guides, resonant cavities, simple radiation systems, and their engineering applications.

ECE 642 Computer Networking (3 Credit Hours)
The course is based on the ISO (International Standard Organization) OSI (Open Systems Interconnection) reference model for computer networks. A focus is placed on the analysis of protocols at different layers, network architectures, and networking systems performance analysis. Current topic areas include LANs, MANs, TCP/IP networks, mobile communications, and ATM.

ECE 643 Computer Architecture Design (3 Credit Hours)
Digital computer design principles. The course focuses on design of state-of-the-art computing systems. An emphasis is placed on superscalar architectures focusing on the pipelining and out-of-order instruction execution operations.

ECE 648 Advanced Digital Design (3 Credit Hours)
This course introduces methods for using high level hardware description language such as VHDL and/or Verilog for the design of digital architecture. Topics include top-down design approaches, virtual prototyping, design abstractions, hardware modeling techniques, algorithmic and register level design, synthesis methods, and application decomposition issues. Final design project is required.

ECE 652 Wireless Communications Networks (3 Credit Hours)
Fundamental concepts in wireless communication systems and networks: radio waveform propagation modeling (free-space, reflections and multipath, fading, diffraction and Doppler

effects); physical and statistical models for wireless channels; modulation schemes for wireless communications and bandwidth considerations; diversity techniques; MIMO systems and space-time coding; multiuser systems and multiple access techniques (TDMA, FDMA. CDMA); spread spectrum and multiuser detection; introduction to wireless networking and wireless standards; current and emerging wireless technologies.

ECE 667 Cooperative Education (1-3 Credit Hours)
Student participation for credit based on academic relevance of the work experience, criteria, and evaluative procedures as formally determined by the department and the Cooperative Education/Career Development Services program prior to the semester in which the work experience is to take place.

ECE 695 Topics in Electrical or Computer Engineering (3 Credit Hours)
This course will be offered as needed, depending upon the need to introduce special subjects to target specific areas of master's-level specializations in electrical or computer engineering.

ECE 842 Computer Communication Networks (3 Credit Hours)
This is an advanced level course in data communications. A focus is placed on the analysis, modeling, and control of computer communication systems. Topics include packet switched networks, circuit switched networks, ATM networks, network programming, network control and performance analysis, network security, and wireless sensor networks.

ECE 854 Advanced Bioelectrics (3 Credit Hours)
Bioelectrics is a new field encompassing both the science and technology of applying electrical stimuli to biological systems. This course covers the pulsed power technology that is required to generate electrical stimuli as well as the biological responses they evoke in cells and tissues. Particular emphasis is placed on the medical applications of bioelectrics, including tumor ablation, gene electrotransfer, wound healing, decontamination with cold plasma, and treatment of cardiac arrhythmias.

ECE 855 Biomembranes and Ion Channels (3 Credit Hours)
This course will give an overview of the structure and dynamics of biomembranes, the ion channels that are embedded in them, and the electrical properties of biomembranes. Topics include molecular dynamics modeling of biomembranes, membrane damage and repair, ion channel dynamics and their experimental assessment using patch clamping, and excitability in neurons and cardiomyocytes.

ECE 862 Digital Control Systems (3 Credit Hours)
Mathematical representation, analysis, and design of discrete-time and sampled-data control systems. Topics include transfer function and state space representations, stability, the root locus method, frequency response methods, and state feedback.

ECE 863 Multivariable Control Systems (3 Credit Hours)

A comprehensive introduction to techniques applicable in control of complex systems with multiple inputs and outputs. Both the frequency domain and state variable approaches are utilized. Special topics include robust and optimal control.

ECE 866 Nonlinear Control Systems (3 Credit Hours)
An introduction to mathematical representation, analysis, and design of nonlinear control systems. Topics include phase-plane analysis, Lyapunov stability theory for autonomous and nonautonomous systems, formal power series methods and differential geometric design techniques.

ECE 872 Fundamentals of Solar Cells (3 Credit Hours)
The course provides an overview of the fundamentals of solar cell technologies, design, and operation. The course is designed for graduate students in Engineering and Science interested in the field of alternative energy. The course objectives are to make sure each student: understands the various forms of alternative energies, understands solar cell design, understands solar cell operation, and acquires knowledge of the various solar cells technologies. The topics to be covered include: Alternative energies; Worldwide status of Photovoltaics; Solar irradiance; Review of semiconductor properties; Generation, recombination; Basic equations of device physics; p-n junction diodes; Ideal solar cells; Efficiency limits; Efficiency losses and measurements; Module fabrication; c-Si technology; classical; Photovoltaic systems; Design of stand-alone system; Residential PV systems.

ECE 873 Introduction to Nanotechnologies (3 Credit Hours)
This course will introduce the rapidly emerging field of nanotechnology with special focus on underlying principles and applications relevant to the nanoscale dimensions. Specifically, this course will cover (1) the basic principles related to synthesis and fabrication of nanomaterials and nanostructures, (2) zero-, one-, two- and three-dimensional nanostructures, (3) characterization and properties of nanomaterials, and (4) application of nanoscale devices.

ECE 874 Semiconductor Characterization (3 Credit Hours)
Introduction of basic methods for semiconductor material and device characterization. Topics include resistivity, carrier doping concentration, contact resistance, Schottky barrier height, series resistance, channel length, threshold voltage, mobility, oxide and interface trapped charge, deep level impurities, carrier lifetime, and optical, chemical and physical characterization.

ECE 875 Non-thermal Plasma Engineering (3 Credit Hours)
This course covers the fundamental principals governing low temperature plasma discharges and their applications. First the fundamental properties of plasmas are introduced. These include the kinetic theory of gases, collisional processes, and plasma sheaths. Then in-depth coverage of the physical mechanisms underlying the operation of non-equilibrium plasma discharges is presented, including important characteristics such as their ignition, evolution, and eventual quenching. Finally, practical applications of non-thermal plasmas, including applications in biology and medicine, are presented.

ECE 877 Semiconductor Process Technology (3 Credit Hours)

Theory, design and fabrication of modern integrated circuits that consist of nano scale devices and materials. Topics include crystal growth and wafer preparation process including epitaxy, thin film deposition, oxidation, diffusion, ion implantation, lithography, dry etching, VLSI process integration, diagnostic assembly and packaging, yield and reliability.

ECE 880 Machine Learning II (3 Credit Hours)
Advanced topics in machine learning and pattern recognition systems. Data reduction techniques including principle component analysis, independent component analysis and manifold learning. Introduction to sparse coding and deep learning for data representation and feature extraction.

ECE 882 Digital Signal Processing II (3 Credit Hours)
Review of time domain and frequency domain analysis of discrete time signals and systems. Fast Fourier Transforms, recursive and non-recursive digital filter analysis and design, multirate signal processing, optimal linear filters, and power spectral estimation.

ECE 883 Digital Image Processing (3 Credit Hours)
Principles and techniques of two-dimensional processing of images. Concepts of scale and spatial frequency. Image filtering in spatial and transform domains. Applications include image enhancement and restoration, image compressing, and image segmentation for computer vision.

ECE 884 Computer Vision (3 Credit Hours)
Principles and applications of computer vision, advanced image processing techniques as applied to computer vision problems, shape analysis and object recognition.

ECE 887 Digital Communications (3 Credit Hours)
Fundamental concepts of digital communication and information transmission: information sources and source coding; orthonormal expansions of signals, basis functions, and signal space concepts; digital modulation techniques including PAM, QAM, PSK and FSK; matched filters, demodulation and optimal detection of symbols and sequences; bandwidth; mathematical modeling of communication channels; channel capacity.

ECE 895 Topics in Electrical and Computer Engineering (3 Credit Hours)
Topics in Electrical and Computer Engineering

ECE 897 Independent Study (1-3 Credit Hours)
This course allows students to develop specialized expertise by independent study (supervised by a faculty member).

APPENDIX C
FACULTY CURRICULUM VITAE (ABBREVIATED)

Al-Assadi, **Waleed K.,** Ph.D., 1996, Computer Engineering, Colorado State University. Lecturer of Electrical and Computer Engineering. Specialization areas: IC design, signal integrity, hardware cybersecurity, and reliability of nanotechnology-based systems.

Alsharif, Salim, Ph.D., 2002, Electrical Engineering, Florida Institute of Technology. Lecturer of Electrical & Computer Engineering. Specialization areas: computer network, communication systems, microprocessor interfacing, embedded systems, and signal processing.

Audette, Michel, Ph.D., 2002, Biomedical Engineering, McGill University. Associate Professor of Electrical and Computer Engineering. **Specialization areas: medical/surgical simulation, surgical planning, and medical device facilitation.**

Baumgart, Helmut, Ph.D., 1981, Physics, University of Stuttgart and Max Planck Institute of Solid State Research (Germany). Professor of Electrical and Computer Engineering and Virginia Micro-Electronics Consortium Endowed Professorship in Microelectronics. Specialization areas: thin films, synthesis of nested nanotube composites, microfluidic devices and electroosmotic pumps, silicon-on-insulator (SOI), and high-performance devices.

Belfore II, **Lee A.,** Ph.D., 1990, Electrical Engineering, University of Virginia; PE. Associate Professor of Electrical and Computer Engineering. **Specialization areas: virtual reality, artificial neural networks, fuzzy logic, computer assisted medical diagnosis, and fault-tolerant computing.**

Chen, Chung-Hao, Ph.D., 2009, University of Tennessee Associate Professor of Electrical and Computer Engineering. Specialization areas: Computer Vision, Robotics, Image Processing, Intelligent Systems, Data Mining, Networked Sensors, Biometrics, Network and Transportation Traffic Analysis, Image and Video Forensic.

Dhali, Shirshak K., Ph.D., 1984, Electrical Engineering, Texas Tech University; PE. Professor of Electrical and Computer Engineering. Specialization areas: atmospheric Pressure Plasma Processing, Wind Energy and Analog VLSI.

Elsayed-Ali, Hani E., Ph.D., 1985, Electrical Engineering, University of Illinois-Urbana. Designated as an Eminent Scholar. Batten Endowed Professor of Electrical and Computer Engineering and Director of the Applied Research Center. Specialization areas: materials, lasers, semiconductors, surface analysis, thin film technology, and physical electronics.

Gonzalez, **Oscar R.,** Ph.D., 1978, Electrical Engineering, University of Notre Dame. Professor and Chair of Electrical and Computer Engineering. Specialization areas: control systems, autonomous, fault tolerant and cyber-security systems.

Gray, William Steven, Ph.D., 1989, Electrical Engineering, Georgia Institute of Technology. Associate Professor of Electrical and Computer Engineering. Specialization areas: formal power series methods for nonlinear systems analysis; realization theory and model reduction for nonlinear systems; fault-tolerant control for safety critical systems.

Iftekharuddin, Khan M., Ph.D., 1995, Electrical Engineering, University of Dayton. Professor of Electrical and Computer Engineering and Batten Endowed Chair in Engineering. Specialization areas: signal and image processing, neural networks applications, time-frequency analysis, sensors and embedded system design, and cybersecurity.

Jiang, Chunqi, Ph.D., 2002, Electrical Engineering, Old Dominion University. Professor of Electrical and Computer Engineering. Specialization areas: atomospheric pressure nanosecond pulsed plasma jets, compact pulsed power systems, and non-equilibrium plasmas for environmental and biomedical applications.

Kong, Michael Ganyu, Ph.D., 1992, Electrical Engineering, University of Liverpool (UK). Professor of Electrical and Computer Engineering and Batten Endowed Chair in Bioeletrics. Specialization areas: cold atmospheric plasma, and its biological effects and applications in medicine, agriculture, and environmental remediation.

Lakdawala, Vishnukumar K., Ph.D., 1980, Electrical Engineering, University of Liverpool (U.K.). Associate Professor of Electrical and Computer Engineering. **Specialization areas:** electron attachment in fluorine compounds, breakdown studies in compressed gases and vacuum, material characterization and simulation studies in compound semiconductors, and high-power semiconductor switches.

Laroussi, **Mounir,** Ph.D., 1988, Electrical Engineering, University of Tennessee, Knoxville. Professor of Electrical and Computer Engineering. Specialization areas: plasma science, biomedical applications of plasmas, gaseous electronics, EM waves interactions with plasmas, and plasma processing.

Leathrum, James F., Ph.D., 1992, Electrical Engineering, Duke University. Associate Professor of Electrical and Computer Engineering. Specialization areas: investigation of ways to accelerate force computations underlying molecular dynamics and astrophysical simulations on parallel computers.

Li, Jiang, Ph.D., 2004, Electrical Engineering, University of Texas at Arlington. Professor of Electrical and Computer Engineering. Specialization areas: machine learning, computer-aided medical diagnosis systems, medical signal/image processing, neural network and modeling and simulation.

Marsillac, Sylvain, Ph.D., 1996, Nanoscale Materials Science, University of Nantes (France). Designated as an Eminent Scholar. Professor of Electrical and Computer Engineering. Specialization areas: microelectronics, solar cells, inorganic materials synthesis and deposition, materials and devices, characterization, and thin films and devices fabrication.

Namkoong, Gon, Ph.D., 2003, Electrical and Computer Engineering, Georgia Institute of Technology. Professor of Electrical and Computer Engineering. Specialization areas: development of nitride/ZnO-based thin films, nanorods and their devices on innovative substrate materials as well as applying new nanoscale thin film growth techniques to facilitate material and device improvement.

Nawarathna, Dharmakeerthi, Ph.D., 2005, Applied Physics, University of Houston. Associate Professor of Electrical and Computer Engineering. Specialization areas: electromagnetism, circuit design and micro/nano fabrication for developing next generation tools for biology, clinical diagnostics and screening.

Popescu, Dimitrie C., Ph.D., 2002, Electrical and Computer Engineering, Rutgers University. Professor of Electrical and Computer Engineering. Specialization areas: embedded systems and wireless networking.

Shen, Yuzhong, Ph.D., 2004, Electrical Engineering, University of Delaware. Professor of Electrical and Computer Engineering. Specialization areas: signal and image processing, visualization and computer graphics, and modeling and simulation.

Shetty, Sachin, Ph.D., 2007, Modeling and Simulation, Old Dominion University. Professor of Electrical and Computer Engineering. Specialization areas: cybersecurity.

Slaughter, Gymama, PhD., 2005, Computer Engineering, Virginia Commonwealth University. Executive Director of the Center for Bioelectronics and Associate Professor of Electrical and Computer Engineering. Specialization areas: biosensors and bioelectronics, BioMems, cell-instructive adhesive materials for regenerative medicine, wound healing, and biomaterials for modulating inflammation and infection.

Sosonkina, **Masha,** Ph.D., 1997, Computer Science and Applications, Virginia Polytechnic Institute and State University. Professor of Electrical and Computer Engineering. Specialization areas: massively parallel optimization, electronic structure theory, next generation hpc architectures, and exoscale computing.

Vahala, Linda L., Ph.D., 1983, Applied Physics, Old Dominion University. Associate Professor of Electrical and Computer Engineering. Specialization areas: plasma physics and atomic physics with an emphasis on laser interactions with plasma and with neutral/rare gas collisions.

Xiao, Shu, Ph.D., 2004, Electrical Engineering, Old Dominion University. Professor of Electrical and Computer Engineering. Specialization areas: pulsed power, bioelectrics, high power antennas.

Xin, Chunsheng, Ph.D., 2002, Computer Science and Engineering, State University of New York at Buffalo. Professor of Electrical and Computer Engineering. Specialization areas: cybersecurity, cognitive radio networks, wireless communications and networking, cyber-physical systems, and performance evaluation and modeling.

Yang, Hong, Ph.D., 2012, Civil Engineering, Rutgers University. Associate Professor of Electrical and Computer Engineering. **Specialization areas:** multi-sensor system for data-driven performance, and modeling and simulation.

APPENDIX D – EXTERNALLY FUNDED GRANTS

APPENDIX E - EMPLOYMENT DEMAND – LETTER OF SUPPORT

APPENDIX F -EMPLOYMENT DEMAND - EMPLOYER SURVEY

Start of Block: Default Question Block

Old Dominion University (ODU) is proposing a Ph.D. in Electrical and Computer Engineering to begin in Fall 2025. We are contacting you to determine the level of interest in this graduate program among potential employers. Your participation is voluntary and your responses are anonymous.

The Ph.D. in Electrical and Computer Engineering is a 49 credit hours degree with a M.S. degree and 79 credit hours degree without a M.S. degree It is designed to prepare graduates to

- **have the ability to discover or develop new engineering knowledge and scholarly skills at an advanced level.**
- **be able analyze advanced, complex electrical and computer engineering problems and develop practical solutions that work within provided specifications and constraints.**
- **develop critical thinking skills and competencies in technical aspects of electrical and computer engineering in current and emerging electrical and computer technologies.**
- **apply leading-edge principles, theories, and concepts to the development of standards, procedures, and guidelines in their chosen field of specialty related to electrical and computer engineering.**
- **work effectively as a member of a team and be able to lead others in teamwork-based projects.**
- **be able to communicate effectively in written, oral, and other modes as needed.**

This proposed program consists of 7 credit hours core courses for students with a M.S. degree, including Statistical Analysis and Simulation, Computational and Statistical Methods in Electrical and Computer Engineering, and graduate seminar, and 22 credit hours for students without a M.S. degree, including instrumentation, automatic control systems, linear systems, numerical methods in engineering analysis, digital signal processing, statistical Analysis and Simulation, Computational and Statistical Methods in Electrical and Computer Engineering, and graduate seminar, and selective courses includes advanced topics related to physical electronics, cybersecurity engineering, networking, biomedical engineering, data analytics, power, semiconductor, and computer vision.

Page Break

How interested would your organization be in hiring an applicant with the Ph.D in Electrical and Computer Engineering described on the previous page?

- Very interested
- Somewhat interested
- Not sure
- Not very interested
- Not at all interested

What is the likelihood that you would hire an applicant with Ph.D. in Electrical and Computer Engineering from ODU if that applicant met all other hiring requirements?

- Very likely
- Somewhat likely
- Not sure
- Somewhat unlikely
- Not at all likely

Does your organization need skills that are difficult to find in the typical applicant pool?

- ○ Yes
- ○ No

Display This Question:

If Does your organization need skills that are difficult to find in the typical applicant pool? = Yes

Does the Ph.D. in Electrical and Computer Engineering address some of those needed skills?

- ○ Yes
- ○ No

Please provide feedback on how this Ph.D. in Electrical and Computer Engineering program would fit with your current and/or future hiring needs.

_____

_____

_____

_____

_____

What type of organization/industry do you work in? (check all that apply)

- [ ] Education
- [ ] Energy
- [ ] Federal, State, or Local Government
- [ ] Technology
- [ ] Healthcare
- [ ] IT
- [ ] Military
- [ ] Other _____

In what city/state is your organization located?

_____

Thank you for completing this survey. Please click "next" to submit your answers.

End of Block: Default Question Block

APPENDIX G- EMPLOYMENT DEMAND - JOB ANNOUNCEMENTS

Job Postings

LinkedIn
https://www.linkedin.com/jobs/search/?currentJobId=3548756883&geoId=101630962&keywords=Ph.D.&location=Virginia%2C%20United%20States&refresh=true

Aerospace Controls Researcher

Aurora Flight Sciences · Manassas, VA (On-site) Reposted 2 weeks ago · 43 applicants

- $90,000/yr - $199,000/yr (from job description) · Full-time · Director
- 501-1,000 employees · Aviation and Aerospace Component Manufacturing
- 2 company alumni work here · 3 school alumni work here
- See how you compare to 43 applicants. Try Premium for $0

Apply
SaveSave Aerospace Controls Researcher at Aurora Flight Sciences
Share
Show more options

Aerospace Controls Researcher

Aurora Flight Sciences Manassas, VA On-site
Apply
SaveSave Aerospace Controls Researcher at Aurora Flight Sciences
Show more options

About the job

Position Overview

At Aurora Flight Sciences, we design, build, and fly advanced aircraft and enabling technologies. We are searching for a talented and self-motivated **Aerospace Controls**

Researcher to help us advance the future of flight. Responsibilities will include but not be limited to the following:

Responsibilities

- Collaborate with top-tier universities to bring the latest exciting developments in research into practical application for Aurora/Boeing projects.
- Contribute to research proposals for government/DOD programs.
- Conduct novel research in autonomy and control for aircraft, leveraging and advancing the state of the art in topics such as adaptive control, machine learning, optimal estimation, and new vehicle architectures that present novel GNC opportunities.
- Present/organize at conferences, workshops, and invited sessions, and publish journal papers.
- Lead the specification, design, development, integration, and test of aircraft GNC/Autonomy systems on ongoing Aurora Programs.
- Supervise technical work.

Minimum Requirements

- Ph.D. or Masters Degree in Aero/Astro, Mechanical or Electrical Engineering with guidance and control emphasis or relevant field.
- Expertise in some, and working knowledge of most of the following: Adaptive control, learning-based control, nonlinear control, optimal control, optimal trajectory design, optimal guidance, missile guidance, and control, reinforcement learning, Kalman filtering, stochastic estimation.
- 3+ years of related professional experience in the aerospace industry.
- Must be fluent in MATLAB and Simulink, with working knowledge of C++ desired.
- Must be a US Person (US Citizen or US Permanent Resident).

Preferred Requirements

- Active DOD clearance.

Physical Requirements

- None.

Salary Range (Annualized USD)

- Minimum Range: $90,000.00 to $160,000.00
- Maximum Range: $112,000.00 to $199,000.00

Aurora Company Overview Aurora Flight Sciences, a Boeing Company, is a leader in the development and manufacturing of advanced unmanned systems and aerospace vehicles. Our mission is to apply autonomy and robotics to the development, production, and operation of advanced aircraft. During the last three decades, Aurora has designed, rapid-prototyped, and flown an average of one new vehicle a year for both government and commercial customers. Now, as an independent subsidiary of Boeing, Aurora's innovation is combined with Boeing's size and strength, creating an unprecedented opportunity to shape the future of aerospace systems.

Equal Opportunity Employer Aurora Flight Sciences, A Boeing Company, is an Equal Opportunity Employer. Employment decisions are made without regard to race, color, religion, national origin, gender, sexual orientation, gender identity, age, physical or mental disability, genetic factors, military/veteran status or other characteristics protected by law.

Aurora Total Rewards At Aurora Flight Sciences, a Boeing Company, we strive to deliver a Total Rewards package that will attract, engage and retain the top talent. Elements of the Total Rewards package include competitive base pay and variable compensation opportunities. Aurora Flight Sciences provides eligible employees with an opportunity to enroll in a variety of benefit programs, generally including health insurance, flexible spending accounts, health savings accounts, retirement savings plans, life and disability insurance programs, and a number of programs that provide for both paid and unpaid time away from work. The specific programs and options available to

any given employee may vary depending on eligibility factors such as geographic location and date of hire. Please note that the salary information shown is a general guideline only. Salaries are based upon candidate experience and qualifications, as well as market and business considerations.

Pay found in job post

Retrieved from the description.

Is this accurate?Yes/No
Base salary

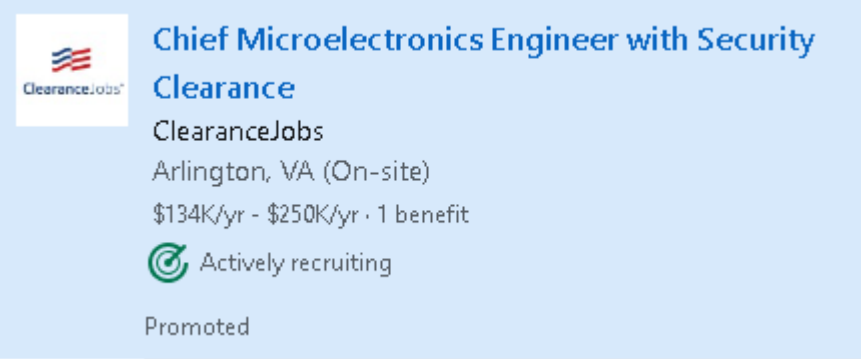
$90,000/yr - $199,000/yr (from job description)

Benefits found in job post

- Medical insurance
- Disability insurance

About the company

Aurora Flight Sciences
27,976 followers
Follow
Aviation and Aerospace Component Manufacturing 501-1,000 employees 879 on LinkedIn
Aurora Flight Sciences, a Boeing Company, advances the future of flight by developing and applying innovations across aircraft configurations, autonomous systems, propulsion technologies, and manufacturing processes. With a passionate and agile team, Aurora delivers solutions to its customers' toughest challenges while meeting high standards of safety and quality.…show more



Chief Microelectronics Engineer with Security Clearance

ClearanceJobs · Arlington, VA (On-site) **5 hours ago** · 0 applicants

- $134,600/yr - $250,000/yr (from job description) · Part-time · Mid-Senior level
- 11-50 employees · Defense and Space Manufacturing
- See recent hiring trends for ClearanceJobs. Try Premium for $0
- Skills: Service Delivery, SC Clearance, +8 more

Apply
SaveSave Chief Microelectronics Engineer with Security Clearance at ClearanceJobs
Share
Show more options

Chief Microelectronics Engineer with Security Clearance

ClearanceJobs Arlington, VA On-site
Apply
SaveSave Chief Microelectronics Engineer with Security Clearance at ClearanceJobs
Show more options

About the job

Job Number: R0163144 Chief Microelectronics Engineer

Key Role: Lead a team of engineers and scientists supporting innovative microelectronics research and development programs. Oversee recruiting, training, retention, and delivery for a team of approximately 25 staff from multiple engineering and scientific fields. Coordinate with Booz Allen senior leaders to drive exceptional delivery of staff and identify and capture new opportunities. Apply subject matter expertise to directly support one or more Department of Defense (DoD) clients on related microelectronics projects. This position is a hybrid role with a combination of working at a Booz Allen office or client site and working remotely . Basic Qualifications: *

7+ years of experience with overseeing science and engineering research

- 7+ years of experience with delivering services or solutions into the DoD or Intelligence Community
- 5+ years of experience with building and leading teams of engineers or scientists
- Secret clearance * Master's degree in Engineering Additional Qualifications: * 5+ years of experience with delivering services or solutions into an ARPA, including DARPA or IARPA agency
- Experience with business development in the government sector
- Possession of excellent verbal and written communication skills
- Possession of excellent analytical skills
- Top Secret clearance * Ph.D. degree in an engineering or scientific field Clearance: Applicants selected will be subject to a security investigation and may need to meet eligibility requirements for access to classified information ; Secret clearance is required. Compensation At Booz Allen, we celebrate your contributions, provide you with opportunities and choices, and support your total well-being. Our offerings include health, life, disability, financial, and retirement benefits, as well as paid leave, professional development, tuition assistance, work-life programs, and dependent care. Our recognition awards program acknowledges employees for exceptional performance and superior demonstration of our values. Full-time and part-time employees working at least 20 hours a week on a regular basis are eligible to participate in Booz Allen's benefit programs. Individuals that do not meet the threshold are only eligible for select offerings, not inclusive of health benefits. We encourage you to learn more about our total benefits by visiting the Resource page on our Careers site and reviewing Our Employee Benefits page. Salary at Booz Allen is determined by various factors, including but not limited to location, the individual's particular combination of education, knowledge, skills, competencies, and experience, as well as contract-specific affordability and organizational requirements. The projected compensation range for this position is $134,600.00 to $250,000.00 (annualized USD). The estimate displayed represents the typical salary range for this position and is just one component of Booz Allen's total compensation package for employees. Work Model Our people-first culture prioritizes the benefits of flexibility and collaboration, whether that happens in person or remotely. * If this position is listed as remote or hybrid, you'll periodically work from a Booz Allen or client site facility.
- If this position is listed as onsite, you'll work with colleagues and clients in person, as needed for the specific role. EEO Commitment We're an equal employment opportunity/affirmative action employer that empowers our people

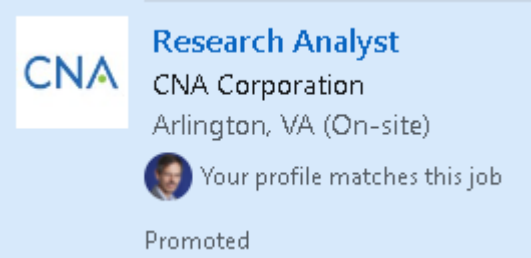
to fearlessly drive change - no matter their race, color, ethnicity, religion, sex (including pregnancy, childbirth, lactation, or related medical conditions), national origin, ancestry, age, marital status, sexual orientation, gender identity and expression, disability, veteran status, military or uniformed service member status, genetic information, or any other status protected by applicable federal, state, local, or international law.

Pay found in job post

Retrieved from the description.

Is this accurate?Yes/No
Base salary

$134,600/yr - $250,000/yr (from job description)



Research Analyst

CNA Corporation · Arlington, VA (On-site) 1 week ago · 29 applicants

- Full-time · Mid-Senior level
- 501-1,000 employees · Research Services
- 4 school alumni work here
- See how you compare to 29 applicants. Try Premium for $0
- Skills: Research Skills

Apply
SaveSave Research Analyst at CNA Corporation
Share
Show more options

Research Analyst

CNA Corporation Arlington, VA On-site
Apply
SaveSave Research Analyst at CNA Corporation
Show more options

About the job

Systems, Tactics, and Force Development conducts quantitative analyses of weapons, sensors, networks and systems — and the tactics for mission success. We develop scientific performance estimates for fleet systems against China, Russia and other threats. Capabilities are assessed under realistic conditions for both current and future-force maritime operations.

Primary Purpose

Staff at this level will be leading smaller/less complex activitiesor will be serving as an important contributing team member on projects.Demonstrates analytical competence.

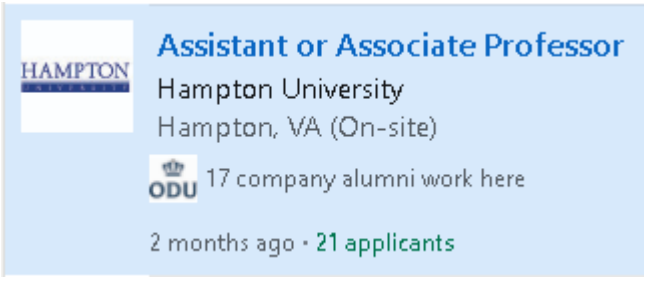
Job Description And/Or Duties

- With minimal or no guidance, meets CNA's quality standards when working on well-structured pieces of a project. Demonstrates ability to develop sound analytic frameworks and associated analytic methodologies/ techniques for addressing both structured and unstructured problems.With direction and supervision, clearly defines, structures, and executes a piece of a complex study to meet quality standards.Demonstrates analytic creativity and curiosity.
- Develops and maintains broad, general institutional knowledge of primary clients/sponsors; their culture, organization, and issues.
- Contributes productively and harmoniously to the work of others; treats everyone respectfully, professionally and fairly. Keeps others informed. Proactively identifies and seeks out others working on similar topics. Works to identify opportunities for collaborations within team, division, and operating unit.
- Supports business development efforts and/or marketing activities by maintaining strong client relationships through high quality work, increasing the visibility of our work, and other related activities such as proposal preparation.
- Interacts with sponsors/clients under the supervision of an experienced colleague, and with study POCs independently.
- Makes significant contributions to research publications and analytic products for individual projects.
- Demonstrates ability to communicate results of work in a clear and concise fashion. Effectively communicates one-on-one and in groups. Can document work efficiently and accurately. Can effectively present work to colleagues, sponsors, and small audiences that are familiar with content.
- Works with minimal or no guidance on focused, well-structured pieces of projects. Works under closer supervision on more complex, less-structured tasks. Can serve as task lead for pieces of projects by managing own activities. May lead small projects under the supervision of an RTL/CMD.
- Exhibits a positive attitude in interactions with colleagues and clients/sponsors.Provides clear guidance to colleagues on tasks.Takes responsibility for own actions and outcomes.
- Performs other duties as assigned.

Job Requirements

- Education: Minimum Master's degree in a STEM field or equivalent experience, Ph.D. preferred.
- Experience: Typical minimum requirements Ph.D. & 0+ years or Master's & 2+ years of experience in research and analysis.
- Skills: Ability to make significant contributions to projects/analyses; Strong analytic curiosity/ creativity;Ability to operate independently in the execution of assignments; Ability to work in a multi-disciplinary environment; Strong critical thinking skills; Knowledge of research techniques; Strong planning and organizational skills; Excellent interpersonal, oral and written communication skills; Ability to interact positively and somewhat independently with clients.
- Other: Ability to obtain and maintain an Active Secret Security Clearance.
- Voluntary (but highly desired) document*** Please include a personal statement as part of your application. A personal statement is a chance for us to get to know you. The statement is your opportunity to share your goals, interests, influences and show us that you will be a valuable asset to our organization. Please click here for personal statement guidelines – Click here Personal statements will not be used as an elimination criteria for this position. They will only be used to enhance a candidate's application

CNA is committed to providing equal employment opportunities (EEO) to all employees and applicants for employment without regard to race, religion, color, sex (including pregnancy, gender identity, and sexual orientation), parental status, national origin, age, disability, family medical history or genetic information, political affiliation, military service and protected veterans, or other non-merit based factors. In addition to federal legal requirements, CNA complies with applicable state and local laws governing nondiscrimination in employment in every location in which the company has facilities. These protections extend to all terms and conditions of employment, including recruiting and hiring practices, promotion, termination, layoff, recall, transfer, leaves of absence, compensation, and training and career development programs. For more information about EEO protections, please view the EEO is the law posters here: "EEO is the Law" Poster" , "EEO Poster Supplement" . The pay transparency policy is available here: Pay Transparency Nondiscrimination Poster . To be considered for hire, all individuals applying for positions with CNA are subject to a background investigation. For positions requiring access to classified information, U.S. citizenship is required. Individuals will also be subject to an additional government background investigation, and continued employment eligibility is contingent upon the ability to obtain and maintain an active security clearance.



Assistant or Associate Professor

Hampton University · Hampton, VA (On-site) 2 months ago · **21 applicants**

- Full-time · Mid-Senior level
- 1,001-5,000 employees · Higher Education
- 17 company alumni work here
- See how you compare to 21 applicants. Try Premium for $0
- Skills: Curriculum Development, Computer Engineering, +8 more

Apply
SaveSave Assistant or Associate Professor at Hampton University
Share
Show more options

Assistant or Associate Professor

Hampton University Hampton, VA On-site
Apply
SaveSave Assistant or Associate Professor at Hampton University
Show more options

About the job

Position

Assistant or Associate Professor

Department

Electrical and Computer Engineering

Date Posted

02/16/2023

Closing Date

Open Until filled

Description

The Hampton University School of Engineering and Technology is seeking candidates for faculty positions in the Department of Electrical and Computer Engineering as an Assistant or Associate Professor.

The appointment is expected to begin in August 2023.

Founded in 1868, Hampton University (www.hamptonu.edu) is located on approximately 300 acres of the Virginia Peninsula. It is a privately endowed, co-educational, nonsectarian institution of higher education and the Southern Association of Colleges and Schools accredit all programs. Hampton University, a member of the Historically Black College and University (HBCU) community of higher education institutions, is currently enjoying tremendous growth and development from a traditionally teaching to a more research-intensive institution.

Hampton University is currently a Masters-level institution of higher learning with a primarily undergraduate student population of approximately 4,600 students pursuing degrees in diverse areas of study.

Duties and Responsibilities

The Department of Electrical and Computer Engineering at Hampton University is seeking candidates for faculty positions at the rank of Assistant or Associate Professor.

The individual selected for this position will be expected to contribute to the educational missions of the Departments of Electrical & Computer Engineering through teaching, curriculum development, and research.

We are interested in candidates who can help expand the departments expertise in Computer Engineering and Cyber Physical System Security.

Qualifications

The successful applicant must have earned a Ph.D. in Computer Engineering, Electrical Engineering, or a closely related field with expertise in cyber, robotics, automation, energy systems, and/or cloud-based computing.

The candidate should have a strong record of scholarly work along with a passion for teaching undergraduate students.

The successful candidate will possess the following skills and abilities: Demonstrated ability to effectively manage and to provide vision for departmental growth Demonstrated ability to mentor junior faculty Demonstrated ability to work on interdisciplinary teams at the university

How to Apply

All Interested Applicants Should Submit a Hampton University Application For Employment For Faculty, a Cover Letter, Curriculum Vitae, Teaching Statement, And Research Statement Via Email To

Review of applications will begin immediately and will continue until the position is filled. The compensation package will be commensurate with rank and experience.

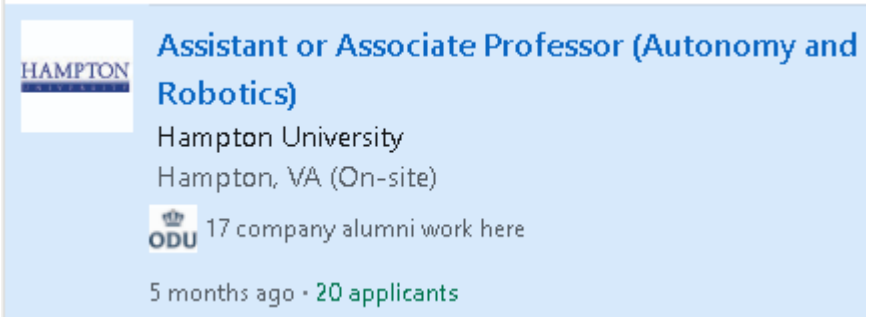
Joyce T. Shirazi, D.Sc., PE Dean, School of Engineering and Technology Hampton University Hampton, VA 23668 joyce.shirazi@hamptonu.edu

We encourage inquiries concerning this career opportunity and welcome the opportunity to answer questions from potential applicants.

Joyce T. Shirazi Email: joyce.shirazi@hamptonu.edu

- Hampton University is an Affirmative Action/Equal Opportunity Employer.

Return to Employment Opportunities List



Assistant or Associate Professor (Autonomy and Robotics)

Hampton University · Hampton, VA (On-site) 5 months ago · **20 applicants**

- Full-time · Mid-Senior level
- 1,001-5,000 employees · Higher Education
- 17 company alumni work here
- See how you compare to 20 applicants. Try Premium for $0
- Skills: Curriculum Development, Research Skills, +8 more

Apply
SaveSave Assistant or Associate Professor (Autonomy and Robotics) at Hampton University
Share
Show more options

Assistant or Associate Professor (Autonomy and Robotics)

Hampton University Hampton, VA On-site
Apply
SaveSave Assistant or Associate Professor (Autonomy and Robotics) at Hampton University
Show more options

About the job

Position

Assistant or Associate Professor (Autonomy and Robotics)

Department

Electrical and Computer Engineering

Date Posted

02/16/2023

Closing Date

Open Until filled

Description

The Hampton University School of Engineering and Technology is seeking candidates for faculty positions in the Department of Electrical and Computer Engineering as an Assistant or Associate Professor. The appointment is expected to begin in August 2023. Founded in 1868, Hampton University (www.hamptonu.edu) is located onapproximately 300acres of the Virginia Peninsula. It is a privately endowed, co-educational, nonsectarian institution of higher education and the Southern Association of Colleges and Schools accredit all programs. Hampton University, a member of the Historically Black College and University (HBCU) community of higher education institutions, is currently enjoying tremendous growth and development from a traditionally teaching to a more research-intensive institution. Hampton University is currently a Masters-level institution of higher learning with a primarily undergraduate student population of approximately 4,600 students pursuing degrees in diverse areas of study.

Duties and Responsibilities

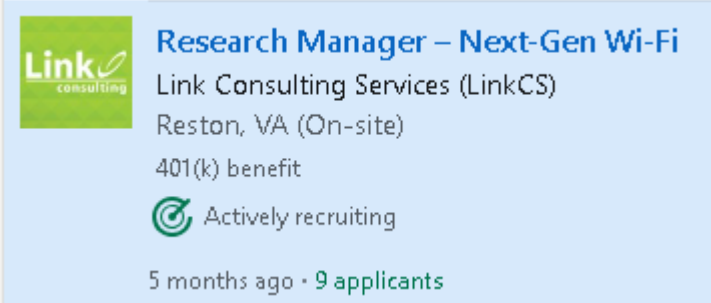
The Department of Electrical and Computer Engineering at Hampton University is seeking candidates for faculty positions at the rank of Assistant or Associate Professor. The individual selected for this position will be expected to contribute to the educational missions of the Departments of Electrical & Computer Engineering through teaching, curriculum development, and research related to Autonomy, Cyber Physical Systems, and Robotics. We are interested in candidates who can help expand the departments expertise in Computer Engineering and Cyber Physical System Security.

Qualifications

The successful applicant must have earned a Ph.D. in Computer Engineering, Electrical Engineering, or a closely related field with expertise in cyber, robotics, automation, energy systems, and/or cloud-based computing. The successful candidate will possess the following skills and abilities: Demonstrated ability to effectively manage multiple priorities-research, education and outreach; Teaching and research experience in related areas Demonstrated ability to work on interdisciplinary teams

How to Apply

Review of applications will begin immediately and will continue until the position is filled. The compensation package will be commensurate with rank andexperience. All interested applicants should submit a Hampton University Application for Employment for faculty, a cover letter, curriculum vitae, teaching statement, and research statement via emailto: Joyce T. Shirazi, D.Sc., PE Dean, School of Engineering and Technology Hampton University Hampton, VA 23668 joyce.shirazi@hamptonu.edu We encourage inquiries concerning this career opportunity and welcome the opportunity to answer questions from potential applicants. Joyce T. Shirazi Email: joyce.shirazi@hamptonu.edu **Hampton University is an Affirmative Action/Equal Opportunity Employer.



Research Manager – Next-Gen Wi-Fi

Link Consulting Services (LinkCS) · Reston, VA (On-site) 5 months ago · **9 applicants**

- Full-time · Mid-Senior level
- 51-200 employees · Staffing and Recruiting
- See how you compare to 9 applicants. Try Premium for $0
- Skills: Patent Law, Electrical Engineering, +8 more

Apply
SaveSave Research Manager – Next-Gen Wi-Fi at Link Consulting Services (LinkCS)
Share
Show more options

Research Manager – Next-Gen Wi-Fi

Link Consulting Services (LinkCS) Reston, VA On-site
Apply
SaveSave Research Manager – Next-Gen Wi-Fi at Link Consulting Services (LinkCS)
Show more options

About the job

This role is for an experienced Research Manager, Next-Gen Wi-Fi to provide leadership in the research and development of Wi-Fi transmission and reception mechanisms. You will provide the planning, implementation, and expansion of short-term and long-term team goals. You will be responsible for all aspects of team management including meeting company goals, planning team resourcing, identifying key priorities, and developing team members. You possess expert knowledge and experience IEEE 802.11, 802.15, and 802.19. Additionally, you have 7+ years of experience in patent creation and processing.

Responsibilities

- Lead a team of researchers on the Next-Gen Wi-Fi research group.
- Provide leadership and mentorship to the Next-Gen Wi-Fi research team.
- Focus on and meet company targets for the Next-Gen Wi-Fi research team.
- Research and optimize advanced Wi-Fi transmission and reception mechanisms.
- Development of novel enhanced algorithms based on IEEE 802.11, 802.15, and 802.19 protocols.
- Provide patentable and standardization-oriented solutions for implementation of new features in Wi-Fi and Wi-Fi/Cellular coexistence technologies.
- Participate in IEEE and other relevant standards bodies to help drive advanced solutions to support business needs.
- Write and present technical contributions to standards bodies including IEEE 802.11
- Supporting the entire patent process from start to end.
- Interact with and present to clients.

Qualifications

You possess expert knowledge of communication theory and IEEE 802.11 standards related technologies such as wireless local area network (WLAN) Wi-Fi, 802.11ac/ax, 802.11ad/aj, ZigBee, 802.19 coexistence, V2X, multi-band, MIMO, Wi-Fi based positioning, and advanced spatial multiplexing mechanisms.

Specifically, you have:

- Advanced technical team leadership
- Ph.D. or M.Sc. degree in Electrical Engineering with at least 7+ years of research and development experience
- A proven track record of successful contributions to IEEE standards and activities
- Experienced in WLAN/Wi-Fi and unlicensed spectrum:
    - Develop physical/MAC layer protocols/procedures – channel access mechanism (e.g., LBT/FBE), MIMO, dual-band operation, channel access mechanisms for mmWave frequencies, multi-beam operation, positioning, power saving techniques
    - Develop use cases and requirements for next generation Wi-Fi, Zigbee, and wireless personal area network (WPAN) communications
    - Link-level/system-level simulation/optimization of wireless systems, protocol layer design, and network signaling

- A proven record of patents related to WLAN/Wi-FI and unlicensed spectrum protocols/applications
- Theoretical understanding of network performance, queuing analysis, and spectral efficiency

Because work will be presented and demonstrated internally and externally, the ideal candidate will be able to be a strong team player.

- Good communicator/presenter
- Creative thinker and problem solver
- Detail-oriented professional
- Strong writer

Additional Information

- 401(K) matching – The company helps you plan and save for retirement with a 401(K) matching program that's available on day one.
- Free PPO healthcare -- You and your family are covered at no charge under great PPO Health plans.
- Free Food -- The kitchen is always fully stocked, including lunch, protein bars, fruit, sodas, coffee and tea.
- Relocation package -- To bring the best in the industry on board, excellent relocation packages are offered.
- Unlimited Paid Time Off -- Lives are enriched by family time, vacations and personal time, so the company offers unlimited paid time off and sick leave.
- On-campus gym -- Unwind, reduce stress and feel great – even when you're at work.

APPENDIX H - STUDENT DEMAND - STUDENT SURVEYS

Student Survey

Start of Block: Default Question Block

Old Dominion University (ODU) is proposing a Ph.D. in Electrical and Computer Engineering degree, instead of General Engineering degree with the concentration on Electrical and Computer Engineering. We are contacting you to determine the level of interest in this program among potential students. Your participation is voluntary, and your responses are anonymous.

The proposed Ph.D. in Electrical and Computer Engineering degree would be a 79-credit hours program beyond the bachelor's degree (49-credit hours post master's). The program is designed to prepare future leaders in electrical and computer engineering research. Graduates will develop skills and competencies in technical aspects of electrical and computer in a diversity of current and emerging electrical and computer technologies and will be prepared to assume responsibility for the management of electrical and computer projects and coordination of electrical and computer research and development teams. Graduates will fill the demand for senior lead positions such as Research Analyst, Program Manager, Scientist, Faculty, and R&D Manager within academic, federal government, state government, non-profit, and private sector environments. The program will also prepare graduates to teach electrical and computer courses in 2- and 4-year colleges and universities.

What is your level of interest in the Electrical and Computer Engineering Ph.D. program described above?

- ○ Very interested
- ○ Somewhat interested
- ○ Not very interested
- ○ Not at all interested

What is the likelihood that you would enroll in the Electrical and Computer Engineering Ph.D. program at Old Dominion University described above?

- ○ Very likely
- ○ Somewhat Likely
- ○ Not very likely
- ○ Not at all likely

Display This Question:

If What is your level of interest in the Electrical and Computer Engineering Ph.D. program described above? = Not very interested

Or What is your level of interest in the Electrical and Computer Engineering Ph.D. program described above? = Not at all interested

And If

What is the likelihood that you would enroll in Electrical and Computer Engineering Ph.D. program at Old Dominion University describe... = Not very likely

Or What is the likelihood that you would enroll in Electrical and Computer Engineering Ph.D. program at Old Dominion University describe... = Not at all likely

Thank you for your time. Please click "Next" to submit your survey responses.

Skip To: End of Survey If Thank you for your time. Please click "Next" to submit your survey responses.() Is Displayed

---

If you enrolled in the Electrical and Computer Engineering Ph.D. program, would you expect to earn:

- ○ General Engineering Degree with the concentration on Electrical and Computer Engineering
- ○ Electrical and Computer Engineering Degree

If you enrolled in the Electrical and Computer Engineering Ph.D. program would you expect to be:

- ○ A full-time student
- ○ A part-time student

What is your class rank?

- ○ Freshman
- ○ Sophomore
- ○ Junior
- ○ Senior
- ○ Other, please specify: _____

Which of the following would influence your decision to pursue an Electrical and Computer Engineering Ph.D. program at ODU?
Select all that apply

- [ ] Opportunity to achieve professional goals
- [ ] Opportunity to work in Electrical & Computer Engineering industry
- [ ] Opportunity to work in Electrical & Computer Engineering industry with the Hampton Roads are
- [ ] Proximity of the campus to where I work/live
- [ ] Reputation of faculty
- [ ] Availability of night courses
- [ ] Availability of streamed courses
- [ ] Opportunity to expand working knowledge of Electrical and Computer Engineering
- [ ] Other: _____

Could you please comment on how this Ph.D. program in Electrical and Computer Engineering would fit with current or future career goals?

_____

_____

_____

April 18, 2024

APPROVAL OF MASTER OF SCIENCE DEGREE PROGRAM IN
ELECTRICAL AND COMPUTER ENGINEERING

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the proposed Master of Science degree program in Electrical and Computer Engineering effective with the fall 2025 semester pending approval by the State Council of Higher Education for Virginia.

Rationale: Old Dominion University seeks approval to initiate a Master of Science degree program in Electrical and Computer Engineering to begin in the fall of 2025. The proposed program will be administered by the Department of Electrical and Computer Engineering in the Batten College of Engineering and Technology.

The proposed M.S. ECE degree will prepare students develop leadership roles careers in industry, government, research organizations, and educational institutions. Graduates with the proposed ECE degree will be able to make original contributions that help society in the grand challenges that we are facing and will face, including in autonomous and connected systems, smart cities, intelligent manufacturing, and smart materials. The program will have three options, thesis, project, and course, each of which has 16 credits core courses to expose the students to foundational tools and the remaining courses will be selected in coordination between the Graduate Program Director and a research advisor to meet the needs of the ECE degree.

The goal of this graduate level, M.S. program is to prepare its graduates to establish themselves as successful professionals in mid-level engineering positions in industry or government setting - by conducting themselves in a responsible, professional, and ethical manner. M.S. students will be evaluated throughout the program using formative assessments, such as, tests, cases studies, capstone project (M.S. with project option), comprehensive exam (M.S. with course option), thesis (M.S. with thesis option), and presentations. Student learning outcomes cover many of the technical and management competencies that are required for the area of electrical and computer engineering.

The M.S. program in Electrical and Computer Engineering will provide a continuously improving learning environment to its students while maintaining high ethical, multicultural, and global standards. The master's program stresses both theoretical and practical aspects of Electrical and Computer Engineering by combining the teaching and research expertise of the ECE faculty with additional research resources in the Hampton Roads area through department labs and university centers/institutes. The first goal of this M.S. program is to prepare its

graduates so they will be able to establish themselves as successful professionals in mid-level engineering positions in industry or government - by conducting themselves in a responsible, professional, and ethical manner. Graduates are employed as electrical and computer engineers supporting industries like automotive, manufacturing, systems integration, shipbuilding, aerospace, defense, telecommunications, etc. They are also employed as researchers by private research and development labs or by federally funded organizations (e.g., Jefferson Lab, NASA, or the Naval Research Laboratories). The second goal of M.S. program is to prepare its graduates so they will be able to demonstrate and assume positions of professional leadership in both industry and government. The third goal of this M.S. program is to prepare its graduates and encourage them to successfully pursue a doctoral degree in their specialty area if they so desire. Graduates of the proposed M.S. in ECE will have the skills and abilities needed for employment and workplace competencies in the field of electrical and computer engineering.

The proposed degree program will prepare students for research and industry careers throughout the Commonwealth of Virginia. The additional training of these students will be sought by employers in southwest, southeast, central, and northern Virginia. For example, HII Newport News Shipbuilding values students with a master's degree that are proficient in controls and computer networks. Manufacturing and companies focusing on data analytics will also benefit from our graduates.

April 18, 2024

CLOSURE OF BACHELOR OF SCIENCE IN EDUCATON IN EARLY CHILDHOOD EDUCATION, PRE-KINDERARTEN THROUGH 3RD GRADE

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the closure of the Bachelor of Science in Education in Early Childhood Education, Pre-Kindergarten through 3rd Grade degree effective with the spring 2025 semester pending approval by the State Council of Higher Education for Virginia.

Rationale: Old Dominion University seeks approval to close the Bachelor of Science in Education in Early Childhood Education, Pre-Kindergarten through 3rd Grade degree effective Spring 2025. The program is housed in the Department of Teaching and Learning in the Darden College of Education and Professional Studies.

In line with our continuous improvement efforts, degree programs have been updated to better reflect the needs of employers hiring ODU graduates. As part of these programmatic changes, we no longer require the Bachelor of Science (BSEd) in Early Childhood Education, Pre-Kindergarten through 3rd Grade degree as students can now earn a Bachelor of Science in Education (BSEd) in Elementary Education, Pre-Kindergarten through 6th Grade. This degree is more appropriate for our students and workforce as it includes early childhood preparation, allows for expanded job opportunities, and typically results in higher paying positions.

After detailed discussions by curricula committees, program faculty, and program directors, the recommendation has been made to close the Bachelor of Science in Education in Early Childhood Education, Pre-Kindergarten through 3rd Grade degree. This closure will have not impact on faculty. A teach out plan will be put in place to allow all currently enrolled and admitted students to either transfer to a comparable degree within the institution, or complete the degree in full prior to the resolution of instruction.

April 18, 2024

APPROVAL OF THE PROPOSED PROGRAM MODIFICATION REQUEST FOR THE OLD DOMINION UNIVERSITY MASTER OF BUSINESS ADMINISTRATION (MBA) PROGRAM TO BECOME A 30 CREDIT HOUR PROGRAM

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the proposed program modification request for the Master of Business Administration (MBA) Program to become a 30 credit-hour program effective fall 2025.

Rationale: Old Dominion University seeks approval to modify the Master of Business Administration (MBA) program to become a 30 credit-hour program for students who have passed prerequisite coursework. This would begin in the fall of 2025.

The current MBA program of 43 credit hours requires all students to take 13 credit hours of prerequisite coursework plus 30 credit hours of the core program. Because the program currently requires 43 credit hours be taken by all students, students with previous business coursework that covers the 13 credit hours of prerequisite requirements, such as students who have already earned business undergraduate degrees or students who have recently completed similar business coursework, must still take 13 credit hours of coursework. It is asked that we decouple the 13 credit hours of prerequisite coursework from the 30-credit hour core program, thereby allowing students who have already completed the appropriate coursework to waive the prerequisite requirements for the MBA degree program. Approximately 30% of incoming students to ODU's MBA Program would be eligible to waive these 13 prerequisite credit hours, and thus begin immediately on the 30-credit hour core program. This program modification reduces the time to degree for students who have already completed the prerequisite coursework and meets the growing demand from companies and the market for a one-year program. In sum, the request is for the ODU MBA to become a 30 credit-hour program by decoupling the 13 credit hours of prerequisite coursework for students with the appropriate previous business coursework. Students with no prior business coursework would still need to complete the 13 credit hours of prerequisite coursework to satisfy the MBA Program requirements.

TABLE OF CONTENTS

PART I: DESCRIPTION OF THE PROPOSED PROGRAM.. 1

A. PROGRAM BACKGROUND..... 1
B. INSTITUTION MISSION 3
C. DELIVERY FORMAT 3
D. ADMISSION CRITERIA..... 3
E. CURRICULUM 4
F. TIME TO DEGREE 7
G. FACULTY RESOURCES 7
H. STUDENT ASSESSMENT 8
I. EMPLOYMENT SKILLS 12
J. RELATIONSHIP TO EXISTING ODU DEGREE PROGRAMS..... 14

PART II: JUSTIFICATION FOR THE PROPOSED PROGRAM.……..…….……4

A. RESPONSE TO CURRENT NEEDS (SPECIFIC DEMAND) 14
B. EMPLOYMENT DEMAND …… 18
C. STUDENT DEMAND …….. 21
D. DUPLICATION 22

PART III: SUMMARY OF PROJECTED STUDENT ENROLLMENT IN PROPOSED PROGRAM……..25

PART IV: PROJECTED RESOURCE NEEDS …….……...……..…25

RESOURCE NEEDS ……..25
RESOURCE NEEDS: PARTS A-D..... 27

APPENDICES ……..……..…….31

APPENDIX A - SAMPLE PLAN OF STUDY
APPENDIX B - COURSE DESCRIPTIONS
APPENDIX C - FACULTY CURRICULUM VITAE (ABBREVIATED)
APPENDIX D – EXTERNALLY FUNDED GRANTS
APPENDIX E - EMPLOYMENT DEMAND-LETTERS OF SUPPORT
APPENDIX F - EMPLOYMENT DEMAND-EMPLOYER SURVEY
APPENDIX G - EMPLOYMENT DEMAND-JOB ANNOUNCEMENTS
APPENDIX H - STUDENT DEMAND-STUDENT INTEREST SURVEYS

Part I: Description of the Proposed Program

A. Program Background

Old Dominion University in Norfolk, Virginia requests approval to initiate a Master of Science (M.S.) degree program in Electrical and Computer Engineering (ECE) with CIP Code 14.4701. This proposed degree program will supersede the concentration in ECE of the M.S. in General Engineering degree with CIP Code 14.0101 that is currently being offered. The proposed program will be administered by the Department of Electrical and Computer Engineering in the Batten College of Engineering & Technology and is to be initiated by Fall 2025.

The proposed M.S. ECE degree will prepare students develop leadership roles careers in industry, government, research organizations, and educational institutions. Graduates with the proposed ECE degree will be able to make original contributions that help society in the grand challenges that we are facing and will face, including in autonomous and connected systems, smart cities, intelligent manufacturing, and smart materials. The program will have three options, thesis, project, and course, each of which has 16 credits core courses to expose the students to foundational tools and the remaining courses will be selected in coordination between the Graduate Program Director and a research advisor to meet the needs of the ECE degree.

B. Institutional Mission

The mission of the institution states: "Old Dominion University, located in the City of Norfolk in the metropolitan Hampton Roads region of coastal Virginia, is a dynamic public research institution that serves its students and enriches the Commonwealth of Virginia, the nation and the world through rigorous academic programs, strategic partnerships, and active civic engagement." The Master of Science in Electrical and Computer Engineering aligns with this mission by (1) offering a robust curriculum that trains individuals in the field of Electrical and Computer Engineering, (2) addressing the critical shortage of employees and managers in the electrical and computer engineering workforce, (3) strengthening ODU's commitment to contributing to the economy and workforce of the Hampton Roads region and the Commonwealth of Virginia, and (4) enhancing the partnerships that ODU has developed throughout the region.

C. Delivery Format

The courses of the proposed M.S. ECE degree will be available in both online and on campus formats. Online course access will be through Zoom, the University's course management

system. The courses will be taught by an ECE faculty in front of students. All assignment submissions and other course management actions can take place in Canvas. Faculty-student interaction is available via email, phone, in-person meetings, and Zoom-interface meetings.

Faculty members who teach in the web-based format are experienced and can be assisted by ODU's Division of Distance Learning and the Center for Faculty Development. If necessary, instructors can be trained to become effective instructors and to develop their courses for online and on campus delivery.

To this end, ODU has made significant investments in the creation of state-of-the-art infrastructure and laboratories for students to conduct research and project, including

- Applied Plasma Technology Laboratory (APTL)
- CAVE Automated Virtual Environment (CAVE)
- Collaborative Autonomous Systems Laboratory
- Cybersecurity, Communications & Networking Innovation (CCNI) Laboratory
- Gene Therapy and Regenerative Medicine Laboratory
- Machine Intelligence & HR Communications Laboratory
- Medical Simulations Laboratory
- Plasma Engineering & Medicine Institute (PEMI)
- Systems Research Laboratory
- Virginia Institute for Photovoltaics (VIPV)
- Vision Lab
- Virginia Institute for Vision Analysis (VIVA)

In addition, the department has several faculty members with research labs at the Applied Research Center (ARC) at the Jefferson National Laboratory, at the Frank Reidy Center for Bioelectronics, at the Center for Bioelectronics and at the Virginia Modeling, Analysis, and Simulation Center (VMASC).

D. Admission Criteria

Applicants are expected to hold a B.S. degree in electrical engineering (EE) or computer engineering (CpE) from an accredited institution. Applicants are also expected to have a minimum grade point average of 3.0 (on a 4.0 scale) in both the baccalaureate major area (EE or CpE) and overall. Applicants with a GPA below a 3.0 may be considered for provisional admission, which may require additional prerequisite courses in addition to the graduate degree requirements. The applications are submitted through the Office of Admissions of Old Dominion University. Together with the completed application form, two letters of recommendation from former instructors or employment supervisors, transcripts from all

colleges and universities attended, GRE scores, a resume, and a personal statement of objectives are required. TOEFL scores are also required for international applicants. Applicants with academic degrees in areas other than electrical and computer engineering will be considered. Those with degrees in math, physics, computer science, or other engineering fields are encouraged to apply. The linked Bachelor's/Master's degree program in the Frank Batten College of Engineering and Technology at Old Dominion University is designed to provide an opportunity for exceptionally qualified engineering undergraduate students to obtain both a bachelor's and a master's degree in Electrical and Computer Engineering. Typically undergraduate students apply at the end of their junior year for admission to the linked programs.

Accepted students from disciplines other than EE or CpE are required to complete a number of leveling courses to meet prerequisites for graduate studies. All students are required to have one year of college chemistry and one year of calculus-based college physics in addition to Calculus III and Differential Equations courses. Students at Old Dominion University may complete the leveling requirement by earning a minor in electrical or computer engineering with a GPA of 3.0 or greater. Students that have not earned a minor need to meet with the graduate program director to prepare a course plan and determine which pre-requisite courses are needed. In general, three to four leveling courses are needed and they are chosen from the following lists.

List of Possible Courses to Meet the Leveling Requirement

ECE 202	Circuit Analysis II	3 Credits
ECE 241	Fundamentals of Computer Engineering	4 Credits
ECE 302	Linear System Analysis	3 Credits
ECE 303	Introduction to Electrical Power	3 Credits
ECE 304	Probability, Statistics, and Reliability	3 Credits
ECE 313	Electronic Circuits	4 Credits
ECE 323	Electromagnetics	3 Credits
ECE 332	Microelectronic Materials and Processes	3 Credits
ECE 341	Digital System Design	3 Credits
ECE 346	Microcontrollers	3 Credits
ECE 381	Introduction to Discrete-time Signal Processing	3 Credits

Students interested in taking computer engineering graduate courses may need to take additional leveling computer science courses as indicated below.

List of Possible Computer Science Courses to Meet the Leveling Requirements

CS 350	Introduction to Software Engineering	3 Credits
CS 361	Data Structures and Algorithms	3 Credits
CS 381	Introduction to Discrete Structures	3 Credits

E. Curriculum

The M.S. degree requires a minimum of 31 credit hours of graduate study. The program offers three options.

- The M.S. degree thesis option requires a minimum of 25 credit hours of courses (including a 1 credit hour Graduate Seminar) and 6 credit hours of thesis along with the oral thesis defense examination.
- The M.S. degree project option requires a minimum of 28 credit hours of courses (including a 1 credit Graduate Seminar) and 3 credit hours of a Master's project course (ECE 698) that includes an oral defense examination.
- The M.S. degree course option requires a minimum of 31 credit hours of courses (including a 1 credit Graduate Seminar) and a written comprehensive examination at the end of the course work.

Curriculum for Thesis Students

Core Course – 16 credit hours
ECE 558 Instrumentation (3 cr)
ECE 561 Automatic Control Systems (3 cr)
ECE 601 Linear Systems (3 cr)
ECE 611 Numerical Methods in Engineering Analysis **(**3 cr)
ECE 612 Digital Signal Processing I **(3 cr)**
ECE 731 Graduate Seminar (1 cr)

Electives – 9 credit hours

Thesis – 6 credit hours
Students will repeat this course as needed until minimum credit hours are fulfilled.
ECE 699 Thesis (1-3 cr)

Additional requirements
Students are required to write and defend in public their thesis successfully.

Total credit hours – 31 credits

Curriculum for Non-Thesis Students

Core Course – 16 credit hours
ECE 558 Instrumentation (3 cr)
ECE 561 Automatic Control Systems (3 cr)
ECE 601 Linear Systems (3 cr)
ECE 611 Numerical Methods in Engineering Analysis **(**3 cr)
ECE 612 Digital Signal Processing I **(3 cr)**
ECE 731 Graduate Seminar (1 cr)

Electives – 12 credit hours

Master's Project (Capstone) – 3 credit hours
ECE 698 Master's Project (3 cr)

Total credit hours – 31 credits

Curriculum for Course-Option Students

Core Course – 16 credit hours
ECE 558 Instrumentation (3 cr)
ECE 561 Automatic Control Systems (3 cr)
ECE 601 Linear Systems (3 cr)
ECE 611 Numerical Methods in Engineering Analysis **(**3 cr)
ECE 612 Digital Signal Processing I **(3 cr)**
ECE 731 Graduate Seminar (1 cr)

Electives – 15 credit hours

Additional Requirements
Written Comprehensive Exam

Total credit hours – 31 credits

Appendix A provides sample schedules for students with course, thesis, and project options. Course descriptions may be fund in Appendix B.

F. Time to Degree

A full-time student will be able to complete the M.S. in ECE in one and half calendar years. Students who wish to do so will be required to complete 12 credit hours in fall semester and 13 credit hours in spring semesters (total of 25 credit hours) and 6 credit hours in the summer. Part-time students will complete the degree in approximately 2.5 years.

G. Faculty Resources

Twenty-seven faculty members holding tenure-track or tenured positions in the department of Electrical and Computer Engineering have credentials to serve as the project advisor for M.S. students with the project option and the committee chair in thesis committee for M.S. students

with the thesis option. M.S. students can also take graduate courses outside ECE. The none-ECE courses are taken in : College of Sciences (Computer Science; Mathematics & Statistics; Physics; Biological Sciences) and the Batten College of Engineering and Technology (Mechanical & Aerospace Engineering; Engineering Management and Systems Engineering).

The faculty have breadth and depth in areas of electrical and computer engineering, ranging from system to physical electronics, from power to renewable energy, and from fundamental signal processing to modeling, simulation, cybersecurity engineering. Combined, they have an extensive record of scholarship. During the past three years they disseminated over 230 peer-reviewed journal publications and over 150 peer-reviewed conference papers in electrical and computer fields. The ECE department has been ranked in the top 30 percent nationally by the National Science Foundation for research expenditures. Faculty members serving as Principal Investigators currently have 145 active research grants that have been awarded over $28,000,000 from prestigious organizations such as the National Science Foundation, Department of Homeland Security, Department of Defense, National Security Agency, Air Force Research Laboratory, and Department of Energy.

Abbreviated CVs for existing full-time faculty members can be found in Appendix C.

H. Student Learning Assessment

The goal of this graduate level, M.S. program is to prepare its graduates to establish themselves as successful professionals in mid-level engineering positions in industry or government setting - by conducting themselves in a responsible, professional, and ethical manner.
M.S. students will be evaluated throughout the program using formative assessments, such as, tests, cases studies, capstone project (M.S. with project option), comprehensive exam (M.S. with course option), thesis (M.S. with thesis option), and presentations. Student learning outcomes cover many of the technical and management competencies that are required for the area of electrical and computer engineering.

1. Communicate in writing their understanding of electrical and computer engineering problems and solutions in a cohesive and well-structured manner;
2. Integrate principles and methods from a variety of disciplines to develop and implement best practices to solve electrical and computer engineering complexities;
3. Orally communicate their understanding of electrical and computer engineering, and explain decisions in cohesive and well-structured presentations to both technical and non-technical audience; and
4. Demonstrate and assume positions of professional leadership in both industry and government setting as well as successfully pursue a doctoral degree in their specialty area if they so desire.
1. as successful faculty members if they choose to join academia.

M.S. Students' learning outcomes assessment approach:

Learning Outcomes	M.S. with Thesis Option	M.S. with Course Option	M.S. with Project Option
1. Advanced Knowledge: Graduates will be able to apply advanced knowledge electrical and computer engineering to their chosen area of expertise in (1) systems, (2) signal and image processing, (3) physical electronics or (4) computer engineering	Thesis (ECE 699): The students' Master's Committee will assess the applicable outcomes based on the Master's Thesis and determine the student's ability by using the "rubrics" developed for this outcome.	Comprehensive Exam: The graduate committee will assess this outcome based on performance on the Master comprehensive examination.	Master Project (ECE 698): The students' project advisor and graduate program director will assess this outcome based on performance on the Master project report by using the "rubrics" developed for this outcome
2. Problem Solving Skills: Graduates will be able to identify and formulate an advanced level electrical and computer engineering problem, to collect and analyze the relevant data and to develop a solution.	Thesis (ECE 699): The students' Master's Committee will assess the applicable outcomes based on the Master's Thesis and determine the student's ability by using the "rubrics" developed for this outcome.	Comprehensive Exam: The graduate committee will assess this outcome based on performance on the Master comprehensive examination. .	Master Project (ECE 698): The students' project advisor and graduate program director will assess this outcome based on performance on the Master Project report by using the "rubrics" developed for this outcome.
3. Written Communication Skills: Graduates will be able to analyze electrical and computer engineering ideas and technical material such as mathematical	Thesis (ECE 699): The students' Master's Committee will assess the applicable outcomes based on the Master's Thesis and determine the student's ability by using the "rubrics"	a. Comprehensive Exam: The graduate committee will assess this outcome based on performance on the Master comprehensive examination b. Course Report:	Master Project (ECE 698): The students' project advisor and graduate program director will assess this outcome based on performance on the Master Project report by using the "rubrics"

equations and data analysis in writing	developed for this outcome.	Graduate program director will assess student's course project report in student's chosen graduate courses by using the "rubrics" developed for this outcome.	developed for this outcome.
4. Verbal/Oral Communication Skills: Graduates will be able to explain electrical and computer engineering problems, methodologies, and related results using both verbal and visual presentation skills	Thesis (ECE 699): The students' Master's Committee will assess the applicable outcomes based on the Master's Thesis defense and determine the student's ability by using the "rubrics" developed for this outcome.	Course Project Presentation: A course presentation is prepared by a student on a topic assigned by the class instructor. Questions directly related to assessment are placed in the assignments and/or examinations in a course. The course instructor evaluates the student responses to these questions to determine their ability level, with respect to the Outcomes, by using the "rubrics" developed for this outcome.	Master Project (ECE 698): The students' project advisor and graduate program director will assess this outcome based on performance on the Master Project presentation by using the "rubrics" developed for this outcome.
5. Independent Research Skills: Graduates will be able to conduct independent research in (1) systems, (2) signal and image processing, (3) physical electronics, or (4) computer engineering	Thesis (ECE 699): The students' Master's Committee will assess the applicable outcomes based on the Master's Thesis and determine the student's ability by using the "rubrics" developed for this outcome.	None	None

Appendix shows rubric to evaluate those outcomes. Appendix shows the comprehensive exam (M.S. with course option) guidelines.

I. Employment Skills

The M.S. program in Electrical and Computer Engineering will provide a continuously improving learning environment to its students while maintaining high ethical, multicultural, and global standards. The master's program stresses both theoretical and practical aspects of Electrical and Computer Engineering by combining the teaching and research expertise of the ECE faculty with additional research resources in the Hampton Roads area through department labs and university centers/institutes. The first goal of this M.S. program is to prepare its graduates so they will be able to establish themselves as successful professionals in mid-level engineering positions in industry or government - by conducting themselves in a responsible, professional, and ethical manner. Graduates are employed as electrical and computer engineers supporting industries like automotive, manufacturing, systems integration, shipbuilding, aerospace, defense, telecommunications, etc. They are also employed as researchers by private research and development labs or by federally funded organizations (e.g., Jefferson Lab, NASA, or the Naval Research Laboratories). The second goal of M.S. program is to prepare its graduates so they will be able to demonstrate and assume positions of professional leadership in both industry and government. The third goal of this M.S. program is to prepare its graduates and encourage them to successfully pursue a doctoral degree in their specialty area if they so desire.

Graduates of the proposed M.S. in ECE will have the skills and abilities needed for employment and workplace competencies in the field of electrical and computer engineering. Specifically, they will have the ability to:

- Graduates will possess skills and competencies in technical aspects of electrical and computer engineering fields, including systems, signal and image processing, physical electronics, computer engineering, and cybersecurity engineering.
- Graduates will analyze and solve practical electrical and computer engineering problems.

J. Relationship to Existing Programs

The existing program at ODU is M.S. in General Engineering with a concentration in Electrical and Computer Engineering. The proposed program is not an expansion of an existing program. The proposed program is a standalone program with a new focus on Electrical and Computer Engineering. No degree programs will be compromised or closed as a result of the initiation and operation of the proposed degree program.

Part II: Justification for the Proposed Program

A. Response to Current Needs (Specific Demand)

The Electrical and Computer Engineering CIP Code 14.4701 was introduced in 2020. Since 2020, 35 institutions have adopted the new CIP code. For example, the Rochester Institute of Technology and the University of Michigan adopted the new CIP code and started offering doctoral degrees in electrical and computer engineering. ODU would be the first university in Virginia to offer graduate degrees in electrical and computer engineering to meet current and future needs.

Shortage of Qualified Electrical and Computer Engineers for New Market Opportunities and Global Competitiveness Advanced Technology in USA

The proposed degree program will prepare students for research and industry careers throughout the Commonwealth of Virginia. The additional training of these students will be sought by employers in southwest, southeast, central, and northern Virginia. For example, HII Newport News Shipbuilding values students with a master's degree that are proficient in controls and computer networks. Manufacturing and companies focusing on data analytics will also benefit from our graduates.

According to the U.S. Bureau of Labor Statistics (BLS), two occupations long associated with innovation – electrical and electronics engineering – have all but stalled in their growth. The slow rate of growth in most manufacturing sectors is getting much of the blame for the stall in this occupation. This bleak view of the field is in direct contrast with industry claims that the United States has a massive shortage of skilled electrical engineers. American companies maintain that this is not an issue of declining demand, but rather one of declining investment in U.S. workers in favor of lobbying Congress for access to inexpensive foreign labor. Some observers claim that the demand for American electrical engineers would improve if the U.S. insisted that rockets that launch astronauts, satellites, weather, and GPS equipment were made in the U.S. The BLS predicts that most opportunities for electrical and electronics engineers will be with engineering service firms, as companies seek to reduce costs by contracting. Electrical engineers familiar with developing technologies in the areas of solar arrays, semiconductors, and communications will be best positioned to find jobs[1,].

According to a CNBC report[2], the software developer (one field of computer engineering) shortage will be alarming in 2022. According to the U.S. Bureau of Labor Statistics (BLS)[3], by 2030, the number of software job vacancies would rise by almost 22%. The average growth rate of software developers in the USA is only 8% right now, and that clearly emphasizes there is already an overwhelming and severe shortage of skilled workers. The talent shortfall starts with college graduates and advanced professionals in the fields of science, technology, engineering and mathematics (STEM). While a shortage of STEM workers will not stop a company's day-to-day operations, it can hamper the pace of growth for the whole industry and, subsequently, have an impact on the competitiveness of entire countries or regions[4].

The proposed degree program will prepare students for research and industry careers throughout the Commonwealth of Virginia. The additional training of these students will be sought by employers in southwest, southeast, central, and northern Virginia. For example, HII Newport News Shipbuilding values students with a master's degree that are proficient in controls and computer networks. Manufacturing and companies focusing on data analytics will also benefit from our graduates.

[1]The job market for electrical engineers in the United states, CareerExplorer, http://www.careerexplorer.com/careers/electrical-engineer/job-market/#whats-the-supply.
[2]The US has nearly 1 million open IT jobs—here's how much it can pay off to switch industries into tech, CNBC, http://www.cnbc.com/2019/11/06/how-switching-careers-to-tech-could-solve-the-us-talent-shortage.html.
[3]Computer Programmers, U.S. Bureau of Labor Statistics, http:// www.bls.gov/ooh/computer-and-information-technology/computer-programmers.htm.
[4]Engineering Talent Shortage Now Top Risk Factor, Semiconductor Engineering. http:// Engineering Talent Shortage Now Top Risk Factor (semiengineering.com)

B. Employment Demand

The proposed M.S. in ECE responds to the need for electrical and computer professionals in the Commonwealth of Virginia, the nation, and the world. In recent U.S. Bureau of Statistics, employment of computer and information research scientists is projected to grow 20 percent from 2020 to 2030, much faster than the average for all occupations[1]. About 9,700 openings for computer programmers are projected each year, on average, over the decade[2]. Overall employment of electrical and electronics engineers is projected to grow 7 percent from 2020 to 2030, about as fast as the average for all occupations[3]. "There are more computers on the manufacturing floor than machine tools and other types of equipment," said Judy Marks, CEO of Siemens USA[4]. More and more factory jobs now demand education, technical know-how or specialized skills. And many of the workers set adrift from low-tech factories lack such qualifications[4]. Computer and information research scientists typically need a master's or higher degree in computer related field, such as electrical and computer engineering[5]. Focusing on cutting edge education and training will be essential for Virginia's and U.S. high technology workforce and economic development as occupations in the electrical and computer industry are highly in demand and among the fastest growing in the economy. The proposed degree program will contribute to addressing such needs by preparing students to understand electrical and computer engineering principles and develop more innovative and advanced systems. Graduates will become the next generation in the high technology workforce to safeguard U.S. the leadership in technology.

[1] Computer and Information Research Scientists, U.S. Bureau of Labor Statistics, http:// www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm.

[2] Computer Programmers, U.S. Bureau of Labor Statistics, http:// www.bls.gov/ooh/computer-and-information-technology/computer-programmers.htm.
[3] Electrical and Electronics Engineers, U.S. Bureau of Labor Statistics, http;// www.bls.gov/ooh/architecture-and-engineering/electrical-and-electronics-engineers.htm.
[4] Lots of High-Tech factory Jobs in U.S., but Skilled Workers Are lacking, The Seattle Times, http:// www.seattletimes.com/business/high-tech-us-plants-offer-jobs-even-as-the-laid-off-struggle/
[5] U. S. Bureau of Labor Statistics, http://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm#tab-4

Labor Market Information: Bureau of Labor Statistics, 2021 -2031 (10-Yr)

Occupation	Base Year Employment	Projected Employment	Total % Change and #s	Typical Entry Level Education
Electrical and Electronics Engineer	303,800	313,600	3%, 9,800	Bachelor's
Computer hardware engineer	76,900	80,600	5%, 3,700	Bachelor's
Computer and information research scientist	33,500	40,600	21%, 7,100	Master's
Computer network architects	174,800	182,300	4%, 7500	Bachelor's
Computer systems analyst	538,800	589,700	9%, 50,900	Bachelor's

Labor Market Information: Virginia Employment Commission, 2020 -2030 (10-Yr)

Occupation	Base Year Employment	Projected Employment	Total % Change and #s	Annual Change #	Education
Electrical Engineer	6155	6666	8.3%, 511	51	Bachelor's
Electronics Engineers, Except Computer	3981	4234	6.3%, 253	25	Bachelor's
Computer and Information Systems Managers	15422	17107	10.9%, 1685	168	Bachelor's

Occupation	Base Year Employment	Projected Employment	Total % Change and #s	Annual Change #	Education
Computer Science Teachers, Postsecondary	1668	1843	10.4%, 175	18	Not applicable

C. Student Demand

Our draft student demand survey is attached as Appendix H which was sent out to ODU ECE majors with Junior, Senior, and MS standing (i.e., those likely already thinking about potential graduate programs) and students outside ODU.

D. Duplication

No university in the Commonwealth of Virginia offers a M.S. degree in Electrical and Computer Engineering. The following tables provide data for similar but not equivalent degrees.

M.S. degree:

Engineering, General (CIP Code: 14.0101)				
Institution	Degree	Program Name	Enrollment	Degrees Awards
Virginia Commonwealth University	M.S.	Engineering	Fall 2021: 17 Fall 2020: 13 Fall 2019: 14 Fall 2018: 23 Fall 2017: 26	Year 2021: 5 Year 2020: 8 Year 2019: 12 Year 2018: 11 Year 2017: 8
Old Dominion University	M.S.	Engineering	Fall 2021: 331 Fall 2020: 300 Fall 2019: 312 Fall 2018: 322 Fall 2017: 316	Year 2021: 81 Year 2020: 106 Year 2019: 100 Year 2018: 97 Year 2017: 100

Electrical and Electronics Engineering (CIP Code: 14.1001)				
Institution	Degree	Program Name	Enrollment	Degrees Awards
George Mason	M.S.	Electrical	Fall 2021: 64	Year 2021: 26

University		Engineering	Fall 2020: 66 Fall 2019: 74 Fall 2018: 86 Fall 2017: 85	Year 2020: 29 Year 2019: 26 Year 2018: 26 Year 2017: 26
University of Virginia	M.S./M.E.	Electrical Engineering	Fall 2021: 39 Fall 2020: 30 Fall 2019: 25 Fall 2018: 29 Fall 2017: 40	Year 2021: 21 Year 2020: 8 Year 2019: 13 Year 2018: 14 Year 2017: 29
Virginia Tech	M.S./M.E.	Electrical Engineering	Fall 2021: 107 Fall 2020: 93 Fall 2019: 110 Fall 2018: 103 Fall 2017: 125	Year 2021: 54 Year 2020: 57 Year 2019: 63 Year 2018: 63 Year 2017: 72
Norfolk State University	M.S.	Electronics Engineering	Fall 2021: 30 Fall 2020: 25 Fall 2019: 26 Fall 2018: 21 Fall 2017: 10	Year 2021: 15 Year 2020: 7 Year 2019: 6 Year 2018: 11 Year 2017: 18

Computer Engineering, General (CIP Code: 14.0901)				
Institution	Degree	Program Name	Enrollment	Degrees Awards
George Manson University	M.S.	Computer Engineering	Fall 2021: 50 Fall 2020: 40 Fall 2019: 41 Fall 2018: 38 Fall 2017: 61	Year 2021: 21 Year 2020: 15 Year 2019: 23 Year 2018: 25 Year 2017: 23
University of Virginia	M.S./M.E	Computer Engineering	Fall 2021: 28 Fall 2020: 20 Fall 2019: 33 Fall 2018: 49 Fall 2017: 44	Year 2021: 15 Year 2020: 27 Year 2019: 27 Year 2018: 27 Year 2017: 18
Virginia Tech	M.S./M.E.	Computer Engineering	Fall 2021: 159 Fall 2020: 115 Fall 2019: 109 Fall 2018: 104 Fall 2017: 113	Year 2021: 61 Year 2020: 49 Year 2019: 57 Year 2018: 61 Year 2017: 55

Virginia Commonwealth University (VCU)

Similarities to ODU

1. Provide thesis (30 credits) and non-thesis option (30 credits).
2. The degree is designated as general engineering with a concentration in electrical and computer engineering.
3. It covers disciplines related to electrical and computer engineering.

Differences from ODU

1. For the non-thesis option, it only has the course option.
2. For the thesis option, it only needs 30 credits and does not require additional 1 credit graduate seminar. It divides course works into two portions, 12 credits concentration component focusing on a specific field of engineering and serving as the student's primary engineering discipline, and 12 credits option electives in either engineering or science with approval of the student's adviser.
2. For the non-thesis option, it divides course works into two portions, 15 credits concentration component focusing on a specific field of engineering and serving as the student's primary engineering discipline, and 15 credits option electives in either engineering or science with approval of the student's adviser. It does not have the comprehensive exam.

George Mason University (GMU)

Similarities to ODU

1. Provide thesis and non-thesis option.
2. It covers disciplines related to electrical and computer engineering, but in two separate degrees, Electrical Engineering and Computer Engineering.

Differences from ODU

1. It provide two separate degrees, Electrical Engineering and Computer Engineering, to focus on electrical and computer engineering disciplines, respectively.
2. For the non-thesis option, it only has the course option, namely scholarly paper option. It does not require the comprehensive exam as part of the requirement, but a written report.
3. No core courses

Virginia Tech (VT)

Similarities to ODU

1. Provide thesis, course, and project options (30 credits).
2. It covers disciplines related to electrical and computer engineering, but in two separate degrees, Electrical Engineering and Computer Engineering.

Differences from ODU

1. It provide two separate degrees, Electrical Engineering and Computer Engineering, to focus on electrical and computer engineering disciplines, respectively.
2. For the course option, it does not require the comprehensive exam.
3. It does not require 1 credit seminar.
4. No core courses

University of Virginia (UVA)

Similarities to ODU
1. Provide thesis (31 credits) and non-thesis option (31 credits).
2. It requires 1 credit seminar.
3. It covers disciplines related to electrical and computer engineering.

Differences from ODU
1. It provide two separate degrees, Electrical Engineering and Computer Engineering, to focus on electrical and computer engineering disciplines, respectively.
2. For non-thesis option, it only has course option. However, it does not have a comprehensive examination for the course option students.
3. No core courses

Norfolk State University (NSU)

Similarities to ODU

M.S.

It has thesis and non-thesis option (master project)

Differences from ODU

M.S.
1. It is focused on two disciplines, Biomedical / Modeling & Simulation Track and Microelectronics and Photonics Track.
2. No courses

Projected enrollment:

Year 1		Year 2		Year 3		Year 4			Year 5		
2025-2026		**2026-2027**		**2027-2028**		**2028-2029**			**2029-2030**		
HDCT	FTES	HDCT	FTES	HDCT	FTES	HDCT	FTES	GRAD	HDCT	FTES	GRAD
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Assumptions:
Retention percentage: 80%
Part-time students: 20%; Full-time students: 80%
Expected time to graduation for full-time: 5 years; and part-time: 7 years
Number of credit hours per semester for full-time: 9; and for part-time: 3-6

Part IV: Projected Resource Needs for the Proposed Program

Resource Needs

Full-Time Faculty
Twenty-seven full-time faculty members who are either tenured or on a tenure track will teach the core course curriculum in the Ph.D. in Electrical and Computer Engineering program, with and Two lecturers teaching associated electives for a total of twenty-nine full-time program faculty.

Part-Time Faculty
No part-time faculty members are required to launch and sustain the proposed program.

Adjunct Faculty
No adjunct faculty members are required to initiate and sustain the proposed program.

Graduate Assistants
No graduate assistants are required to initiate and sustain the proposed program.

Classified Positions
No classified position is requested to initiate and sustain the proposed program.

Targeted Financial Aid
No targeted financial aid is required to launch and sustain the proposed program.

Library
No new library resources are required to launch and sustain the proposed program. The University Libraries has a strong collection in the Electrical and Computer Engineering. Many current journals are found in the online databases, and the library has a responsive interlibrary loan program for resources outside of the current collection. The Department of Electrical and Computer Engineering has an annual allowance for books or journals.

Telecommunications
No new telecommunication resources are needed to initiate and sustain the proposed program.

Equipment (including computers)
No new equipment resources are needed to initiate and sustain this proposed program.

Space
No additional space is needed to initiate and sustain this proposed program.

Other Resources (specify)
No new resources will be required to launch or operate the proposed Master of Science in Electrical and Computer Engineering.

Funds to Initiate and Operate the Degree Program

Cost and Funding Sources to Initiate and Operate the Program			
	Informational Category	Program Initiation Year 2025-2026	Program Full Enrollment Year 2028-2029
1	Projected Enrollment (Headcount)	56	75
2	Projected Enrollment (FTE)	38	56

3	Projected Enrollment Headcount of In- State Students	$16,369 (in-state) $38,595 (out-of-state)	$18,949 (in-state) $44,679 (out-of-state)
4	Projected Enrollment Headcount of Out- of-State Students	$1,050,020	$1,627,015
5	Estimated Annual Tuition and E&G Fees for In-state Students in the Proposed Program		
6	Estimated Annual Tuition and E&G Fees for Out-of-State Students in the Proposed Program		
7	Projected Total Revenue from Tuition and E&G Fees Due to the Proposed Program		
8	Other Funding Sources Dedicated to the Proposed Program (e.g., grant, business entity, private sources)	$0.00	$0.00

Resource Needs: Parts A - D

Part A: Answer the following questions about general budget information.

- Has or will the institution submit an addendum budget request to cover one-time costs? Yes _____ No X
- Has or will the institution submit an addendum budget request to cover operating costs? Yes _____ No X
- Will there be any operating budget requests for this program that would exceed normal operating budget guidelines (for example, unusual faculty mix, faculty salaries, or resources)? Yes _____ No X
- Will each type of space for the proposed program be within projected guidelines? Yes X No _____
- Will a capital outlay request in support of this program be forthcoming? Yes _____ No X

Part D: Certification Statement(s)

The institution will require additional state funding to initiate and sustain this program.

_____ Yes _____
Signature of Chief Academic Officer

__X__ No _____
Signature of Chief Academic Officer

Secondary Certification.

If resources are reallocated from another unit to support this proposal, the institution will **not** subsequently request additional state funding to restore those resources for their original purpose.

__X__ Agree _____
Signature of Chief Academic Officer

_____ Disagree _____
Signature of Chief Academic Officer

APPENDICES

APPENDIX A
PLAN OF STUDY

Sample Plan of Study for Full-Time Students
Thesis Option

Course	Credits	Category
Fall I		
ECE 558 Instrumentation	3	Core
ECE 561 Automatic Control Systems	3	Core
ECE 601 Linear Systems	3	Core
ECE 731 Graduate Seminar	1	Core
TOTAL 10 credits		
Spring I		
ECE 611 Numerical Methods in Engineering Analysis	3	Core
ECE 612 Digital Signal Processing I (3 Credit Hours)	3	Core
Elective Courses	3	Elective
TOTAL 19 credits		
Summer I		
Elective Courses	3	Elective
TOTAL 3 credits		
Fall II		
Elective Courses	3	Elective
ECE 699	6	Thesis
TOTAL 9 credits		

Total Required for Degree—31 credits

Course Option

Course	Credits	Category
Fall I		
ECE 558 Instrumentation	3	Core
ECE 561 Automatic Control Systems	3	Core
ECE 601 Linear Systems	3	Core
ECE 731 Graduate Seminar	1	Core
TOTAL 10 credits		
Spring I		
ECE 611 Numerical Methods in Engineering Analysis	3	Core
ECE 612 Digital Signal Processing I (3 Credit Hours)	3	Core
Elective Courses	3	Elective
TOTAL 19 credits		
Summer I		
Elective Courses	3	Elective
TOTAL 3 credits		
Fall II		
Elective Courses	3	Elective
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 9 credits		

Total Required for Degree—31 credits

Project Option

Course	Credits	Category
Fall I		
ECE 558 Instrumentation	3	Core
ECE 561 Automatic Control Systems	3	Core
ECE 601 Linear Systems	3	Core
ECE 731 Graduate Seminar	1	Core
TOTAL 10 credits		
Spring I		
ECE 611 Numerical Methods in Engineering Analysis	3	Core
ECE 612 Digital Signal Processing I (3 Credit Hours)	3	Core
Elective Courses	3	Elective
TOTAL 19 credits		
Summer I		
Elective Courses	3	Elective
TOTAL 3 credits		
Fall II		
Elective Courses	3	Elective
Elective Courses	3	Elective
ECE 698	3	Capstone
TOTAL 9 credits		

Total Required for Degree—31 credits

Sample Plan of Study for Part-Time Students
Thesis Option

Course	Credits	Category
Fall I		
ECE 558 Instrumentation	3	Core
ECE 561 Automatic Control Systems	3	Core
ECE 731 Graduate Seminar	1	Core
TOTAL 7 credits		
Spring I		
ECE 601 Linear Systems	3	Core
ECE 611 Numerical Methods in Engineering Analysis	3	Core
TOTAL 6 credits		
Fall II		
ECE 612 Digital Signal Processing I (3 Credit Hours)	3	Core
Elective Courses	3	Elective
TOTAL 6 credits		
Spring II		
Elective Courses	3	Elective

Elective Courses	3	Elective
TOTAL 6 credits		
Fall III		
ECE 699	6	Thesis
TOTAL 6 credits		

Total Required for Degree—31 credits

Course Option

Course	Credits	Category
Fall I		
ECE 558 Instrumentation	3	Core
ECE 561 Automatic Control Systems	3	Core
ECE 731 Graduate Seminar	1	Core
TOTAL 7 credits		
Spring I		
ECE 601 Linear Systems	3	Core
ECE 611 Numerical Methods in Engineering Analysis	3	Core
TOTAL 6 credits		
Fall II		
ECE 612 Digital Signal Processing I (3 Credit Hours)	3	Core
Elective Courses	3	Elective
TOTAL 6 credits		
Spring II		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Fall III		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		

Total Required for Degree—31 credits

Project Option

Course	Credits	Category
Fall I		
ECE 558 Instrumentation	3	Core
ECE 561 Automatic Control Systems	3	Core
ECE 731 Graduate Seminar	1	Core
TOTAL 7 credits		
Spring I		

ECE 601 Linear Systems	3	Core
ECE 611 Numerical Methods in Engineering Analysis	3	Core
TOTAL 6 credits		
Fall II		
ECE 612 Digital Signal Processing I (3 Credit Hours)	3	Core
Elective Courses	3	Elective
TOTAL 6 credits		
Spring II		
Elective Courses	3	Elective
Elective Courses	3	Elective
TOTAL 6 credits		
Fall III		
Elective Courses	3	Elective
ECE 698	3	Capstone
TOTAL 6 credits		

Total Required for Degree—31 credits

APPENDIX B
COURSE DESCRIPTIONS

Core Courses

ECE 558 Instrumentation (3 Credit Hours)
Computer interfacing using a graphical programming language with applications involving digital-to-analog conversion (DAC), analog-to-digital conversion (ADC), digital input output (DIO), Virtual Instrument System Architecture (VISA) and universal Service Bus (USB). Analysis of sampled data involving use of probability density function, mean and standard derivations, correlations, and the power spectrum.

ECE 561 Automatic Control Systems (3 Credit Hours)
Analysis and design of control systems as found in automobiles and aircraft, autonomous vehicles, robots, and many other engineering systems. Time and frequency domain techniques such as root locus, Bode, Nyquist and state space techniques are utilized together with computer-aided analysis and design.

ECE 601 Linear Systems (3 Credit Hours)
A comprehensive introduction to the analysis of linear dynamical systems from an input-output and state space point of view. Concepts from linear algebra, numerical linear algebra and linear operator theory are used throughout. Some elements of state feedback design and state estimation are also covered.

ECE 611 Numerical Methods in Engineering Analysis (3 Credit Hours)
Course intended to provide graduate students in Electrical and Computer Engineering with a basic knowledge of numerical methods applied to engineering problem-solving process. The course includes the following topics: Introduction to computing (Matlab), Truncation errors and Taylor series, Numerical integration, Solution of non-linear equations, Least-Square regression, Interpolations, Ordinary and partial differential equations, and Finite difference methods. Applications to the area of electrical engineering.

ECE 612 Digital Signal Processing I (3 Credit Hours)
This course will present the fundamentals of digital signal processing. Topics will include frequency domain analysis of discrete-time linear systems, sampling and reconstruction of signals, the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), and digital filter design and implementations. Practical applications and examples will be discussed. Problem solving using MATLAB is required.

ECE 731 Graduate Seminar (1 Credit Hour)
Graduate seminar presentations concerning technical topics of current interest given by faculty and invited speakers.

Elective Courses

ECE 503 Power Electronics (3 Credit Hours)

Power electronics provides the needed interface between an electrical source and an electrical load and facilitates the transfer of power from a source to a load by converting voltages and currents from one form to another. Topics include: alternating voltage rectification, Pulse Width Modulation (PWM), DC converters (Buck, Boost, Buck-Boost, Cuk and SEPIC converters), negative feedback control in power electronics, isolated switching mode power supply, flyback and forward power supply, solid state power switches, AC inverter.

ECE 504 Electric Drives (3 Credit Hours)
Electric drives efficiently control the torque, speed and position of electric motors. This course has a multi-disciplinary nature and includes fields such as electric machine theory, power electronics, and control theory. Topics include: switch-mode power electronics, magnetic circuit, DC motor, AC motor, Brushless DC motor, induction motor, speed control of induction motor, vector control of induction motor, stepper-motor.

ECE 505 Power System Design & Analysis (3 Credit Hours)
This course covers basic power circuit analysis and introductory power system engineering and focuses on the transmission line design, power flow study, short circuit protection, and power distribution in electric power systems, followed by a survey of several applications and case studies.

ECE 506 Computer Graphics and Visualization (3 Credit Hours)
The course provides a practical treatment of computer graphics and visualization with emphasis on modeling and simulation applications. It covers digital image and signal processing basics such as sampling and discrete Fourier transform, computer graphics fundamentals, visualization principles, and software architecture for visualization in modeling and simulation. Written communication and information literacy skills are stressed in this course.

ECE 507 Introduction to Game Development (3 Credit Hours)
An introductory course focused on game development theory and modern practices with emphasis on educational game development. Topics include game architecture, computer graphics theory, user interaction, audio, high level shading language, animation, physics, and artificial intelligence. The developed games can run on a variety of computer, mobile, and gaming platforms.

ECE 508 Fundamentals of Electric Vehicles (3 Credit Hours)
This course covers the fundamentals of electric vehicles and focuses on the components, power control, energy management, power train dynamics and other related topics in purely electric and hybrid electric vehicle systems, including a survey of several applications and case studies.

ECE 509 Introduction to Distributed Simulation (3 Credit Hours)
An introduction to distributed simulation. Topics include motivation for using distributed simulation, distributed simulation architectures, time management issues, and distributed simulation approaches. Current standards for distributed simulation are presented.

ECE 510 Model Engineering (3 Credit Hours)
The goal of this course is to develop understanding of the various modeling paradigms appropriate for capturing system behavior and conducting digital computer simulation of many types of systems. The techniques and concepts discussed typically include UML, concept graphs, Bayesian nets, Markov models, Petri nets, system dynamics, Bond graphs, etc. Students will report on a particular technique and team to implement a chosen system model.

ECE 516 Cyber Defense Fundamentals (3 Credit Hours)
This course focuses on cybersecurity theory, information protection and assurance, and computer systems and networks security. The objectives are to understand the basic security models and concepts, learn fundamental knowledge and tools for building, analyzing, and attacking modern security systems, and gain hands-on experience in cryptographic algorithms, security fundamental principles, and Internet security protocol and standards.

ECE 519 Cyber Physical System Security (3 Credit Hours)
Cyber Physical Systems (CPS) integrate computing, networking, and physical processes. The objectives of this course are to learn the basic concepts, technologies and applications of CPS, understand the fundamental CPS security challenges and national security impact, and gain hands-on experience in CPS infrastructures, critical vulnerabilities, and practical countermeasures.

ECE 541 Advanced Digital Design and Field Programmable Gate Arrays (3 Credit Hours)
Course will present FPGA technologies and methods using CAD design tools for implementation of digital systems using FPGAs. Topics include advanced methods of digital circuit design including specification, synthesis, implementation and prototyping; managing multiple clock domains, static timing analysis, timing closure, system reset design, simulation, and optimization; troubleshooting using embedded logic analyzers and integrated development environments (IDEs). Practical system design examples include general purpose data processing, system on a chip (SOC) prototyping, hardware accelerators, and an introduction to domain specific architectures.

ECE 543 Computer Architecture (3 Credit Hours)
An introduction to computer architectures. Analysis and design of computer subsystems including central processing units, memories and input/output subsystems. Important concepts include datapaths, computer arithmetic, instruction cycles, pipelining, virtual and cache memories, direct memory access and controller design.

ECE 545 Introduction to Computer Vision (3 Credit Hours)
Overview of digital image processing including visual perception, image formation, spatial transformations, image enhancement, color image representation and processing, edge detection, image segmentation, and data processing method for computer vision applications. Hand-on projects will be introduced to better understand computer vision applications.

ECE 550 Introduction to Machine Learning for Data Analytics Engineering (3 Credit Hours)

Machine Learning provides a practical treatment of design, analysis and implementation of algorithms, which learn from examples. Topics include multiple machine learning models: linear regression, logistic regression, neural networks, support vector machines, deep learning, Bayesian learning and unsupervised learning. Students are expected to use popular machine learning tools and algorithms to solve real data engineering problems.

ECE 551 Communication Systems (3 Credit Hours)
Fundamentals of communication systems engineering. Modulation methods including continuous waveform modulation (amplitude, angle). Design and analysis of modulation systems and performance in the presence of noise. Communication simulation exercises through computer experiments.

ECE 552 Introduction to Wireless Communication Networks (3 Credit Hours)
Introduction to current wireless network technologies and standards. The radio frequency spectrum and radio wave propagation models (pathloss, fading, and multipath). The radio link and link budgets. Modulation, diversity, and multiple access techniques. Wireless network planning and operation. Current and emerging wireless technologies (satellite systems, vehicular/sensor networks).

ECE 553 Analysis for Modeling and Simulation (3 Credit Hours)
An introduction to analysis techniques appropriate to the conduct of modeling and simulation studies. Topics include input modeling, random number generation, output analysis, variance reduction techniques, and experimental design. In addition, techniques for verification & validation are introduced.

ECE 554 Introduction to Bioelectrics (3 Credit Hours)
Covers the electrical properties of cells and tissues as well as the use of electrical and magnetic signals and stimuli in the diagnosis and treatment of disease. Typical topics to be covered include basic cell physiology, endogenous electric fields in the body, electrocardiography, cardiac pacing, defibrillation, electrotherapy, electroporation, electrotherapy in wound healing. In addition, ultrashort electrical pulses for intracellular manipulation and the application of plasmas to biological systems will be covered.

ECE 555 Network Engineering and Design (3 Credit Hours)
This course is an extension of ECE 355 into a semester long project. Emphasis is on gaining an understanding of networking design principles that entails all aspects of the network development life cycle. Topics include campus LAN models and design, VLANs, internetworking principles and design, WAN design, design of hybrid IP networks, differentiated vs. integrated services, traffic flow measurement and management.

ECE 562 Introduction to Medical Image Analysis (MIA) (3 Credit Hours)
Introduction to basic concepts in medical image analysis. Medical image registration, segmentation, feature extraction, and classification are discussed. Basic psychophysics, fundamental ROC analysis and FROC methodologies are covered.

ECE 563 Design and Modeling of Autonomous Robotic Systems (3 Credit Hours)
This course focuses on autonomous robotics systems with emphasis on using modeling and simulation (M&S) for system level design and testing. Fundamental concepts associated with autonomous robotic systems are discussed. Course topics include: robotic control, architectures, and sensors as well as more advanced concepts such as error propagation, localization, mapping and autonomy. Design strategies that leverage M&S to accelerate the development and testing of sophisticated autonomous robotic algorithms for individual or teams of robots are covered.

ECE 564 Biomedical Applications of Low Temperature Plasmas (3 Credit Hours)
This course is cross listed between ECE, BME and BIOL. It is designed to be taken by senior undergraduate students and first year graduate students. The course contents are multidisciplinary, combining materials from engineering and the biological sciences. The course covers an introduction to the fundamentals of non-equilibrium plasmas, low temperature plasma sources, and cell biology. This is followed by a detailed discussion of the interaction of low temperature plasma with biological cells, both prokaryotes and eukaryotes. Potential applications in medicine such as wound healing, blood coagulation, sterilization, and the killing of various types of cancer cells will be covered.

ECE 570 Foundations of Cyber Security (3 Credit Hours)
Course provides an overview of theory, tools and practice of cyber security and information assurance through prevention, detection and modeling of cyber attack and recovery from such attacks. Techniques for security modeling, attack modeling, risk analysis and cost-benefit analysis are described to manage the security of cyber systems. Fundamental principles of cyber security and their applications for protecting software and information assets of individual computers and large networked systems are explored. Anatomy of some sample attacks designed to compromise confidentiality, integrity and availability of cyber systems are discussed.

ECE 571 Introduction to Solar Cells (3 Credit Hours)
This course is designed to provide the fundamental physics and characteristics of photovoltaic materials and devices. A focus is placed on i) optical interaction, absorption, and design for photovoltaic materials and systems, ii) subsequent energy conversion processes in inorganic/organic semiconductor such as generation, recombination, and charge transport, and iii) photovoltaic testing and measurement techniques to characterize solar cells including contact and series resistance, open circuit voltage, short circuit current density, fill factor, and energy conversion efficiency of photovoltaic devices.

ECE 572 Plasma Processing at the Nanoscale (3 Credit Hours)
The science and design of partially ionized plasma and plasma processing devices used in applications such as etching and deposition at the nanoscale. Gas phase collisions, transport parameters, DC and RF glow discharges, the plasma sheath, sputtering, etching, and plasma deposition.

ECE 573 Solid State Electronics (3 Credit Hours)

The objective of this course is to understand basic semiconductor devices by understanding semiconductor physics (energy bands, carrier statistics, recombination and carrier drift and diffusion) and to gain an advanced understanding of the physics and fundamental operation of advanced semiconductor devices. Following the initial introductory chapters on semiconductor physics, this course will focus on the theory of p-n junctions, metal-semiconductor Schottky diodes, MOS capacitors, MOS field effect transistors (MOSFET) and bipolar junction transistors (BJTs).

ECE 574 Optical Fiber Communication (3 Credit Hours)
This course introduces seniors and first year graduates to the physics and design of optical fiber communication systems. The topics covered are: electromagnetic waves; optical sources including laser diodes; optical amplifiers; modulators; optical fibers; attenuation and dispersion in optical fibers; photodetectors; optical receivers; noise considerations in optical receivers; optical communication systems.

ECE 575 Transportation Data Analytics (3 Credit Hours)
This course presents the basic techniques for transportation data analytics. It will discuss statistical modeling, prominent algorithms, and visualization approaches to analyze both small- and large-scale data sets generated from transportation systems. Practices of using different data for various real-world traffic/transportation applications and decision making will also be discussed.

ECE 583 Embedded Systems (3 Credit Hours)
This course covers fundamentals of embedded systems: basic architecture, programming, and design. Topics include processors and hardware for embedded systems, embedded programming and real time operating systems.

ECE 607 Machine Learning I (3 Credit Hours)
Course provides a practical treatment of design, analysis, implementation and applications of algorithms. Topics include multiple machine learning models: linear models, neural networks, support vector machines, instance-based learning, Bayesian learning, genetic algorithms, ensemble learning, reinforcement learning, unsupervised learning, etc.

ECE 623 Electromagnetism (3 Credit Hours)
Review of electrostatic and magnetostatic concepts, time varying field, Maxwell's equations, plane wave propagation in various media, transmission lines, optical wave guides, resonant cavities, simple radiation systems, and their engineering applications.

ECE 642 Computer Networking (3 Credit Hours)
The course is based on the ISO (International Standard Organization) OSI (Open Systems Interconnection) reference model for computer networks. A focus is placed on the analysis of protocols at different layers, network architectures, and networking systems performance

analysis. Current topic areas include LANs, MANs, TCP/IP networks, mobile communications, and ATM.

ECE 643 Computer Architecture Design (3 Credit Hours)
Digital computer design principles. The course focuses on design of state-of-the-art computing systems. An emphasis is placed on superscalar architectures focusing on the pipelining and out-of-order instruction execution operations.

ECE 648 Advanced Digital Design (3 Credit Hours)
This course introduces methods for using high level hardware description language such as VHDL and/or Verilog for the design of digital architecture. Topics include top-down design approaches, virtual prototyping, design abstractions, hardware modeling techniques, algorithmic and register level design, synthesis methods, and application decomposition issues. Final design project is required.

ECE 652 Wireless Communications Networks (3 Credit Hours)
Fundamental concepts in wireless communication systems and networks: radio waveform propagation modeling (free-space, reflections and multipath, fading, diffraction and Doppler effects); physical and statistical models for wireless channels; modulation schemes for wireless communications and bandwidth considerations; diversity techniques; MIMO systems and space-time coding; multiuser systems and multiple access techniques (TDMA, FDMA. CDMA); spread spectrum and multiuser detection; introduction to wireless networking and wireless standards; current and emerging wireless technologies.

ECE 667 Cooperative Education (1-3 Credit Hours)
Student participation for credit based on academic relevance of the work experience, criteria, and evaluative procedures as formally determined by the department and the Cooperative Education/Career Development Services program prior to the semester in which the work experience is to take place.

ECE 695 Topics in Electrical or Computer Engineering (3 Credit Hours)
This course will be offered as needed, depending upon the need to introduce special subjects to target specific areas of master's-level specializations in electrical or computer engineering.

ECE 731 Graduate Seminar (1 Credit Hour)
Graduate seminar presentations concerning technical topics of current interest given by faculty and invited speakers.

ECE 742 Computer Communication Networks (3 Credit Hours)
This is an advanced level course in data communications. A focus is placed on the analysis, modeling, and control of computer communication systems. Topics include packet switched networks, circuit switched networks, ATM networks, network programming, network control and performance analysis, network security, and wireless sensor networks.

ECE 751 Computational and Statistical Methods in Biomedical Engineering (3 Credit Hours)
This course covers the theoretical foundation and application of commonly used techniques in biomedical engineering. Topics include linear algebra, partial differential equations, regression analysis, applied probabilities, multivariate distributions, Bayesian statistics, hypothesis tests, multiple comparisons, ANOVA, solution of non-linear equations, numerical methods and optimization. Programming software will be used to perform simulations and analyze biomedical data.

ECE 754 Advanced Bioelectrics (3 Credit Hours)
Bioelectrics is a new field encompassing both the science and technology of applying electrical stimuli to biological systems. This course covers the pulsed power technology that is required to generate electrical stimuli as well as the biological responses they evoke in cells and tissues. Particular emphasis is placed on the medical applications of bioelectrics, including tumor ablation, gene electrotransfer, wound healing, decontamination with cold plasma, and treatment of cardiac arrhythmias.

ECE 755 Biomembranes and Ion Channels (3 Credit Hours)
This course will give an overview of the structure and dynamics of biomembranes, the ion channels that are embedded in them, and the electrical properties of biomembranes. Topics include molecular dynamics modeling of biomembranes, membrane damage and repair, ion channel dynamics and their experimental assessment using patch clamping, and excitability in neurons and cardiomyocytes.

ECE 762 Digital Control Systems (3 Credit Hours)
Mathematical representation, analysis, and design of discrete-time and sampled-data control systems. Topics include transfer function and state space representations, stability, the root locus method, frequency response methods, and state feedback.

ECE 763 Multivariable Control Systems (3 Credit Hours)
A comprehensive introduction to techniques applicable in control of complex systems with multiple inputs and outputs. Both the frequency domain and state variable approaches are utilized. Special topics include robust and optimal control.

ECE 766 Nonlinear Control Systems (3 Credit Hours)
An introduction to mathematical representation, analysis, and design of nonlinear control systems. Topics include phase-plane analysis, Lyapunov stability theory for autonomous and nonautonomous systems, formal power series methods and differential geometric design techniques.

ECE 772 Fundamentals of Solar Cells (3 Credit Hours)
The course provides an overview of the fundamentals of solar cell technologies, design, and operation. The course is designed for graduate students in Engineering and Science interested in the field of alternative energy. The course objectives are to make sure each student: understands

the various forms of alternative energies, understands solar cell design, understands solar cell operation, and acquires knowledge of the various solar cells technologies. The topics to be covered include: Alternative energies; Worldwide status of Photovoltaics; Solar irradiance; Review of semiconductor properties; Generation, recombination; Basic equations of device physics; p-n junction diodes; Ideal solar cells; Efficiency limits; Efficiency losses and measurements; Module fabrication; c-Si technology; classical; Photovoltaic systems; Design of stand-alone system; Residential PV systems.

ECE 773 Introduction to Nanotechnologies (3 Credit Hours)
This course will introduce the rapidly emerging field of nanotechnology with special focus on underlying principles and applications relevant to the nanoscale dimensions. Specifically, this course will cover (1) the basic principles related to synthesis and fabrication of nanomaterials and nanostructures, (2) zero-, one-, two- and three-dimensional nanostructures, (3) characterization and properties of nanomaterials, and (4) application of nanoscale devices.

ECE 774 Semiconductor Characterization (3 Credit Hours)
Introduction of basic methods for semiconductor material and device characterization. Topics include resistivity, carrier doping concentration, contact resistance, Schottky barrier height, series resistance, channel length, threshold voltage, mobility, oxide and interface trapped charge, deep level impurities, carrier lifetime, and optical, chemical and physical characterization.

ECE 775 Non-thermal Plasma Engineering (3 Credit Hours)
This course covers the fundamental principals governing low temperature plasma discharges and their applications. First the fundamental properties of plasmas are introduced. These include the kinetic theory of gases, collisional processes, and plasma sheaths. Then in-depth coverage of the physical mechanisms underlying the operation of non-equilibrium plasma discharges is presented, including important characteristics such as their ignition, evolution, and eventual quenching. Finally, practical applications of non-thermal plasmas, including applications in biology and medicine, are presented.

ECE 777 Semiconductor Process Technology (3 Credit Hours)
Theory, design and fabrication of modern integrated circuits that consist of nano scale devices and materials. Topics include crystal growth and wafer preparation process including epitaxy, thin film deposition, oxidation, diffusion, ion implantation, lithography, dry etching, VLSI process integration, diagnostic assembly and packaging, yield and reliability.

ECE 780 Machine Learning II (3 Credit Hours)
Advanced topics in machine learning and pattern recognition systems. Data reduction techniques including principle component analysis, independent component analysis and manifold learning. Introduction to sparse coding and deep learning for data representation and feature extraction.

ECE 782 Digital Signal Processing II (3 Credit Hours)
Review of time domain and frequency domain analysis of discrete time signals and systems. Fast Fourier Transforms, recursive and non-recursive digital filter analysis and design, multirate signal processing, optimal linear filters, and power spectral estimation.

ECE 783 Digital Image Processing (3 Credit Hours)
Principles and techniques of two-dimensional processing of images. Concepts of scale and spatial frequency. Image filtering in spatial and transform domains. Applications include image enhancement and restoration, image compressing, and image segmentation for computer vision.

ECE 784 Computer Vision (3 Credit Hours)
Principles and applications of computer vision, advanced image processing techniques as applied to computer vision problems, shape analysis and object recognition.

ECE 787 Digital Communications (3 Credit Hours)
Fundamental concepts of digital communication and information transmission: information sources and source coding; orthonormal expansions of signals, basis functions, and signal space concepts; digital modulation techniques including PAM, QAM, PSK and FSK; matched filters, demodulation and optimal detection of symbols and sequences; bandwidth; mathematical modeling of communication channels; channel capacity.

ECE 795 Topics in Electrical and Computer Engineering (3 Credit Hours)
Topics in Electrical and Computer Engineering

ECE 797 Independent Study (1-3 Credit Hours)
This course allows students to develop specialized expertise by independent study (supervised by a faculty member).

Capstone Course for the Project Option

ECE 698 Master's Project (1-3 Credit Hours)
Individual project directed by the student's professor in major area of study.

Course for the Thesis Option

ECE 699 Thesis (1-6 Credit Hours)
Directed research for the master's thesis.

APPENDIX C
FACULTY CURRICULUM VITAE (ABBREVIATED)

Al-Assadi, **Waleed K.,** Ph.D., 1996, Computer Engineering, Colorado State University. Lecturer of Electrical and Computer Engineering. Specialization areas: IC design, signal integrity, hardware cybersecurity, and reliability of nanotechnology-based systems.

Alsharif, Salim, Ph.D., 2002, Electrical Engineering, Florida Institute of Technology. Lecturer of Electrical & Computer Engineering. Specialization areas: computer network, communication systems, microprocessor interfacing, embedded systems, and signal processing.

Audette, Michel, Ph.D., 2002, Biomedical Engineering, McGill University. Associate Professor of Electrical and Computer Engineering. **Specialization areas: medical/surgical simulation, surgical planning, and medical device facilitation.**

Baumgart, Helmut, Ph.D., 1981, Physics, University of Stuttgart and Max Planck Institute of Solid State Research (Germany). Professor of Electrical and Computer Engineering and Virginia Micro-Electronics Consortium Endowed Professorship in Microelectronics. Specialization areas: thin films, synthesis of nested nanotube composites, microfluidic devices and electroosmotic pumps, silicon-on-insulator (SOI), and high-performance devices.

Belfore II, **Lee A.,** Ph.D., 1990, Electrical Engineering, University of Virginia; PE. Associate Professor of Electrical and Computer Engineering. **Specialization areas: virtual reality, artificial neural networks, fuzzy logic, computer assisted medical diagnosis, and fault-tolerant computing.**

Chen, Chung-Hao, Ph.D., 2009, University of Tennessee Associate Professor of Electrical and Computer Engineering. Specialization areas: Computer Vision, Robotics, Image Processing, Intelligent Systems, Data Mining, Networked Sensors, Biometrics, Network and Transportation Traffic Analysis, Image and Video Forensic.

Dhali, Shirshak K., Ph.D., 1984, Electrical Engineering, Texas Tech University; PE. Professor of Electrical and Computer Engineering. Specialization areas: atmospheric Pressure Plasma Processing, Wind Energy and Analog VLSI.

Elsayed-Ali, Hani E., Ph.D., 1985, Electrical Engineering, University of Illinois-Urbana. Designated as an Eminent Scholar. Batten Endowed Professor of Electrical and Computer Engineering and Director of the Applied Research Center. Specialization areas: materials, lasers, semiconductors, surface analysis, thin film technology, and physical electronics.

Gonzalez, **Oscar R.,** Ph.D., 1978, Electrical Engineering, University of Notre Dame. Professor and Chair of Electrical and Computer Engineering. Specialization areas: control systems, autonomous, fault tolerant and cyber-security systems.

Gray, William Steven, Ph.D., 1989, Electrical Engineering, Georgia Institute of Technology. Associate Professor of Electrical and Computer Engineering. Specialization areas: formal power series methods for nonlinear systems analysis; realization theory and model reduction for nonlinear systems; fault-tolerant control for safety critical systems.

Iftekharuddin, Khan M., Ph.D., 1995, Electrical Engineering, University of Dayton. Professor of Electrical and Computer Engineering and Batten Endowed Chair in Engineering.

Specialization areas: signal and image processing, neural networks applications, time-frequency analysis, sensors and embedded system design, and cybersecurity.

Jiang, Chunqi, Ph.D., 2002, Electrical Engineering, Old Dominion University. Professor of Electrical and Computer Engineering. Specialization areas: atomospheric pressure nanosecond pulsed plasma jets, compact pulsed power systems, and non-equilibrium plasmas for environmental and biomedical applications.

Kong, Michael Ganyu, Ph.D., 1992, Electrical Engineering, University of Liverpool (UK). Professor of Electrical and Computer Engineering and Batten Endowed Chair in Bioeletrics. Specialization areas: cold atmospheric plasma, and its biological effects and applications in medicine, agriculture, and environmental remediation.

Lakdawala, Vishnukumar K., Ph.D., 1980, Electrical Engineering, University of Liverpool (U.K.). Associate Professor of Electrical and Computer Engineering. **Specialization areas:** electron attachment in fluorine compounds, breakdown studies in compressed gases and vacuum, material characterization and simulation studies in compound semiconductors, and high-power semiconductor switches.

Laroussi, **Mounir,** Ph.D., 1988, Electrical Engineering, University of Tennessee, Knoxville. Professor of Electrical and Computer Engineering. Specialization areas: plasma science, biomedical applications of plasmas, gaseous electronics, EM waves interactions with plasmas, and plasma processing.

Leathrum, James F., Ph.D., 1992, Electrical Engineering, Duke University. Associate Professor of Electrical and Computer Engineering. Specialization areas: investigation of ways to accelerate force computations underlying molecular dynamics and astrophysical simulations on parallel computers.

Li, Jiang, Ph.D., 2004, Electrical Engineering, University of Texas at Arlington. Professor of Electrical and Computer Engineering. Specialization areas: machine learning, computer-aided medical diagnosis systems, medical signal/image processing, neural network and modeling and simulation.

Marsillac, Sylvain, Ph.D., 1996, Nanoscale Materials Science, University of Nantes (France). Designated as an Eminent Scholar. Professor of Electrical and Computer Engineering. Specialization areas: microelectronics, solar cells, inorganic materials synthesis and deposition, materials and devices, characterization, and thin films and devices fabrication.

Namkoong, Gon, Ph.D., 2003, Electrical and Computer Engineering, Georgia Institute of Technology. Professor of Electrical and Computer Engineering. Specialization areas: development of nitride/ZnO-based thin films, nanorods and their devices on innovative substrate materials as well as applying new nanoscale thin film growth techniques to facilitate material and device improvement.

Nawarathna, Dharmakeerthi, Ph.D., 2005, Applied Physics, University of Houston. Associate Professor of Electrical and Computer Engineering. Specialization areas: electromagnetism, circuit design and micro/nano fabrication for developing next generation tools for biology, clinical diagnostics and screening.

Popescu, Dimitrie C., Ph.D., 2002, Electrical and Computer Engineering, Rutgers University. Professor of Electrical and Computer Engineering. Specialization areas: embedded systems and wireless networking.

Shen, Yuzhong, Ph.D., 2004, Electrical Engineering, University of Delaware. Professor of Electrical and Computer Engineering. Specialization areas: signal and image processing, visualization and computer graphics, and modeling and simulation.

Shetty, Sachin, Ph.D., 2007, Modeling and Simulation, Old Dominion University. Professor of Electrical and Computer Engineering. Specialization areas: cybersecurity.
Slaughter, Gymama, PhD., 2005, Computer Engineering, Virginia Commonwealth University. Executive Director of the Center for Bioelectronics and Associate Professor of Electrical and Computer Engineering. Specialization areas: biosensors and bioelectronics, BioMems, cell-instructive adhesive materials for regenerative medicine, wound healing, and biomaterials for modulating inflammation and infection.
Sosonkina, **Masha,** Ph.D., 1997, Computer Science and Applications, Virginia Polytechnic Institute and State University. Professor of Electrical and Computer Engineering. Specialization areas: massively parallel optimization, electronic structure theory, next generation hpc architectures, and exoscale computing.
Vahala, Linda L., Ph.D., 1983, Applied Physics, Old Dominion University. Associate Professor of Electrical and Computer Engineering. Specialization areas: plasma physics and atomic physics with an emphasis on laser interactions with plasma and with neutral/rare gas collisions.
Xiao, Shu, Ph.D., 2004, Electrical Engineering, Old Dominion University. Professor of Electrical and Computer Engineering. Specialization areas: pulsed power, bioelectrics, high power antennas.
Xin, Chunsheng, Ph.D., 2002, Computer Science and Engineering, State University of New York at Buffalo. Professor of Electrical and Computer Engineering. Specialization areas: cybersecurity, cognitive radio networks, wireless communications and networking, cyber-physical systems, and performance evaluation and modeling.
Yang, Hong, Ph.D., 2012, Civil Engineering, Rutgers University. Associate Professor of Electrical and Computer Engineering. **Specialization areas:** multi-sensor system for data-driven performance, and modeling and simulation.

APPENDIX D – EXTERNALLY FUNDED GRANTS

APPENDIX E - EMPLOYMENT DEMAND – LETTER OF SUPPORT

APPENDIX F -EMPLOYMENT DEMAND - EMPLOYER SURVEY

Employer Survey for MS degree

Start of Block: Default Question Block

Old Dominion University (ODU) is proposing a Master of Science in Electrical and Computer Engineering to begin in Fall 2025. We are contacting you to determine the level of interest in this graduate program among potential employers. Your participation is voluntary and your responses are anonymous.

The M.S. in Electrical and Computer Engineering is a 31 credit-hour degree. It is designed to help prepare technology leaders who will fill the demand for highly skilled electrical and computer engineering specialists and practitioners. It will prepare its graduates for high-level positions, working in a wide variety of capacities to analyze and solve practical electrical and computer engineering problems. Students will be educated to develop skills and competencies in technical aspects of electrical and computer engineering fields, including systems, signal and image processing, physical electronics, computer engineering, and cybersecurity engineering.

This proposed program offers three options:

- **The M.S. degree thesis option requires a minimum of 25 credit hours of courses (including the 1 credit hour Graduate Seminar) and 6 credit hours of thesis along with the oral thesis defense examination.**
- **The M.S. degree project option requires a minimum of 28 credit hours of courses (including the 1 credit Graduate Seminar) and 3 credit hours of Master's project course that includes an oral defense examination.**
- **The M.S. degree course option requires a minimum of 31 credit hours of courses (including the 1 credit Graduate Seminar) and a written comprehensive examination at the end of the course work.**

Graduate courses consist of five core courses (16 credit hours), including instrumentation, automatic control systems, linear systems, numerical methods in engineering analysis, digital signal processing, and graduate seminar, and selective courses includes advanced topics related to physical electronics, cybersecurity engineering, networking, biomedical engineering, data analytics, power, semiconductor, and computer vision.

Page Break

How interested would your organization be in hiring an applicant with the M.S. in Electrical and Computer Engineering described on the previous page?

- ○ Very interested
- ○ Somewhat interested
- ○ Not sure
- ○ Not very interested
- ○ Not at all interested

What is the likelihood that you would hire an applicant with M.S. in Electrical and Computer Engineering from ODU if that applicant met all other hiring requirements?

- ○ Very likely
- ○ Somewhat likely
- ○ Not sure
- ○ Somewhat unlikely
- ○ Not at all likely

Does your organization need skills that are difficult to find in the typical applicant pool?

- ○ Yes
- ○ No

Display This Question:

If Does your organization need skills that are difficult to find in the typical applicant pool? = Yes

Does the M.S. in Electrical and Computer Engineering address some of those needed skills?

- ○ Yes
- ○ No

Please provide feedback on how this M.S. in Electrical and Computer Engineering program would fit with your current and/or future hiring needs.

_____

_____

_____

_____

_____

What type of organization/industry do you work in? (check all that apply)

- ☐ Education
- ☐ Energy
- ☐ Federal, State, or Local Government
- ☐ Technology
- ☐ Healthcare
- ☐ IT
- ☐ Military
- ☐ Other _____

In what city/state is your organization located?

_____

Thank you for completing this survey. Please click "next" to submit your answers.

End of Block: Default Question Block

APPENDIX G- EMPLOYMENT DEMAND - JOB ANNOUNCEMENTS

APPENDIX H - STUDENT DEMAND - STUDENT SURVEYS

Student Survey

Start of Block: Default Question Block

Old Dominion University (ODU) is proposing a PhD in Electrical and Computer Engineering degree, instead of General Engineering degree with the concentration on Electrical and Computer Engineering. We are contacting you to determine the level of interest in this program among potential students. Your participation is voluntary, and your responses are anonymous.

The proposed PhD in Electrical and Computer Engineering degree would be a 79-credit hours program beyond the bachelor's degree (49-credit hours post master's). The program is designed to prepare future leaders in electrical and computer engineering research. Graduates will develop skills and competencies in technical aspects of electrical and computer in a diversity of current and emerging electrical and computer technologies and will be prepared to assume responsibility for the management of electrical and computer projects and coordination of electrical and computer research and development teams. Graduates will fill the demand for senior lead positions such as Research Analyst, Program Manager, Scientist, Faculty, and R&D Manager within academic, federal government, state government, non-profit, and private sector environments. The program will also prepare graduates to teach electrical and computer courses in 2- and 4-year colleges and universities.

What is your level of interest in the Electrical and Computer Engineering PhD program described above?

- ○ Very interested
- ○ Somewhat interested
- ○ Not very interested
- ○ Not at all interested

What is the likelihood that you would enroll in the Electrical and Computer Engineering PhD program at Old Dominion University described above?

- ○ Very likely
- ○ Somewhat Likely
- ○ Not very likely
- ○ Not at all likely

Display This Question:

If What is your level of interest in the Electrical and Computer Engineering PhD program described above? = Not very interested

Or What is your level of interest in the Electrical and Computer Engineering PhD program described above? = Not at all interested

And If

What is the likelihood that you would enroll in Electrical and Computer Engineering PhD program at Old Dominion University describe... = Not very likely

Or What is the likelihood that you would enroll in Electrical and Computer Engineering PhD program at Old Dominion University describe... = Not at all likely

Thank you for your time. Please click "Next" to submit your survey responses.

Skip To: End of Survey If Thank you for your time. Please click "Next" to submit your survey responses.() Is Displayed

---

If you enrolled in the Electrical and Computer Engineering PhD program, would you expect to earn:

- ○ General Engineering Degree with the concentration on Electrical and Computer Engineering
- ○ Electrical and Computer Engineering Degree

If you enrolled in the Electrical and Computer Engineering PhD program would you expect to be:

- ○ A full-time student
- ○ A part-time student

What is your class rank?

- ○ Freshman
- ○ Sophomore
- ○ Junior
- ○ Senior
- ○ Other, please specify: _____

Which of the following would influence your decision to pursue an Electrical and Computer Engineering PhD program at ODU?
Select all that apply.

- [ ] Opportunity to achieve professional goals
- [ ] Opportunity to work in Electrical & Computer Engineering industry
- [ ] Opportunity to work in Electrical & Computer Engineering industry with the Hampton Roads area
- [ ] Proximity of the campus to where I work/live
- [ ] Reputation of faculty
- [ ] Availability of night courses
- [ ] Availability of streamed courses
- [ ] Opportunity to expand working knowledge of Electrical and Computer Engineering
- [ ] Other: _____

Could you please comment on how this PhD program in Electrical and Computer Engineering would fit with current or future career goals?

_____

_____

_____