Undergraduate Program Report to Advisory Board Summer 2018
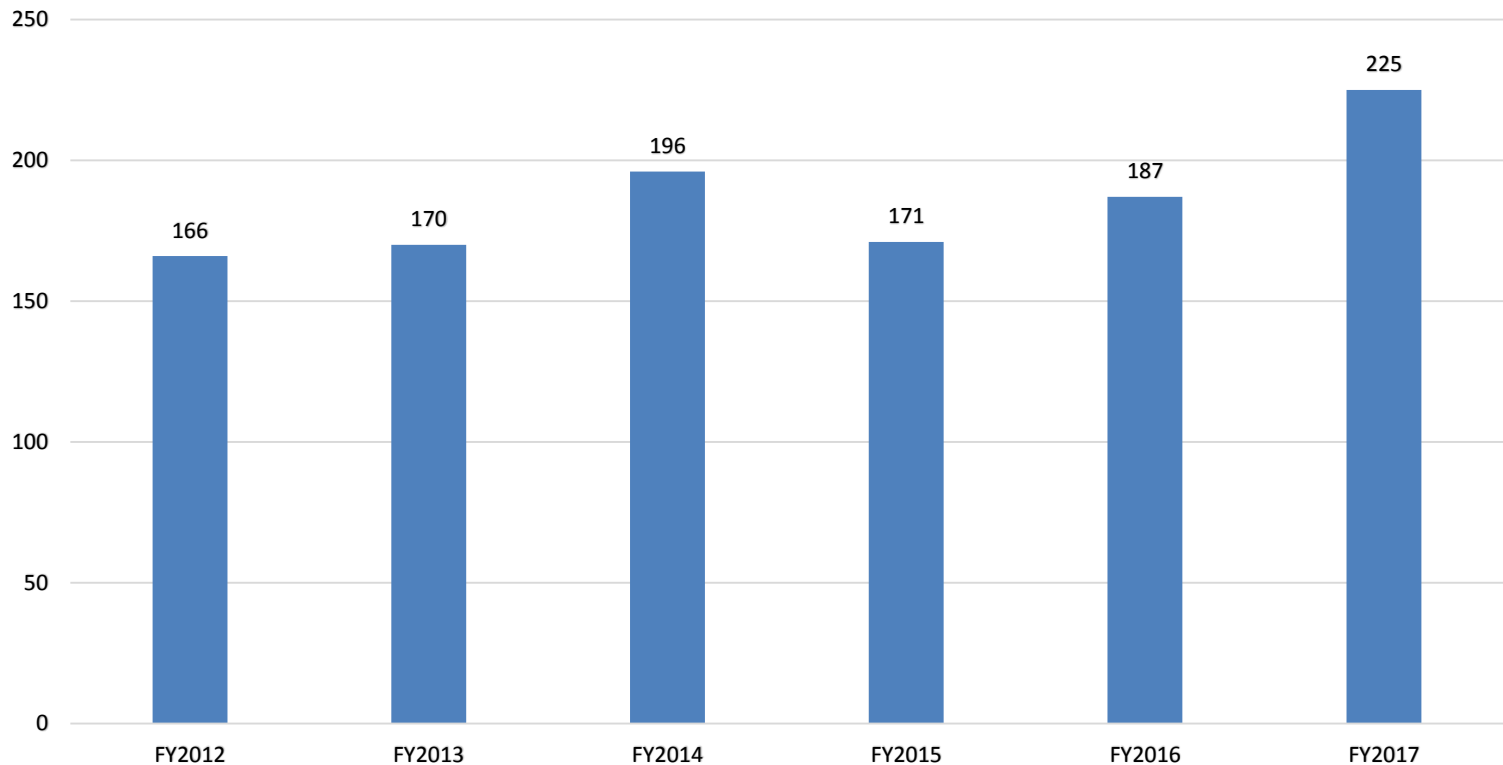
Mel Gomez

- Graduation/Enrollment Numbers
- UG Achievements Since 2011
- Enrollment/Retention Trends
- Revision of CpE Curriculum
- BS ES and IoT @ Shady Grove
- E-bike
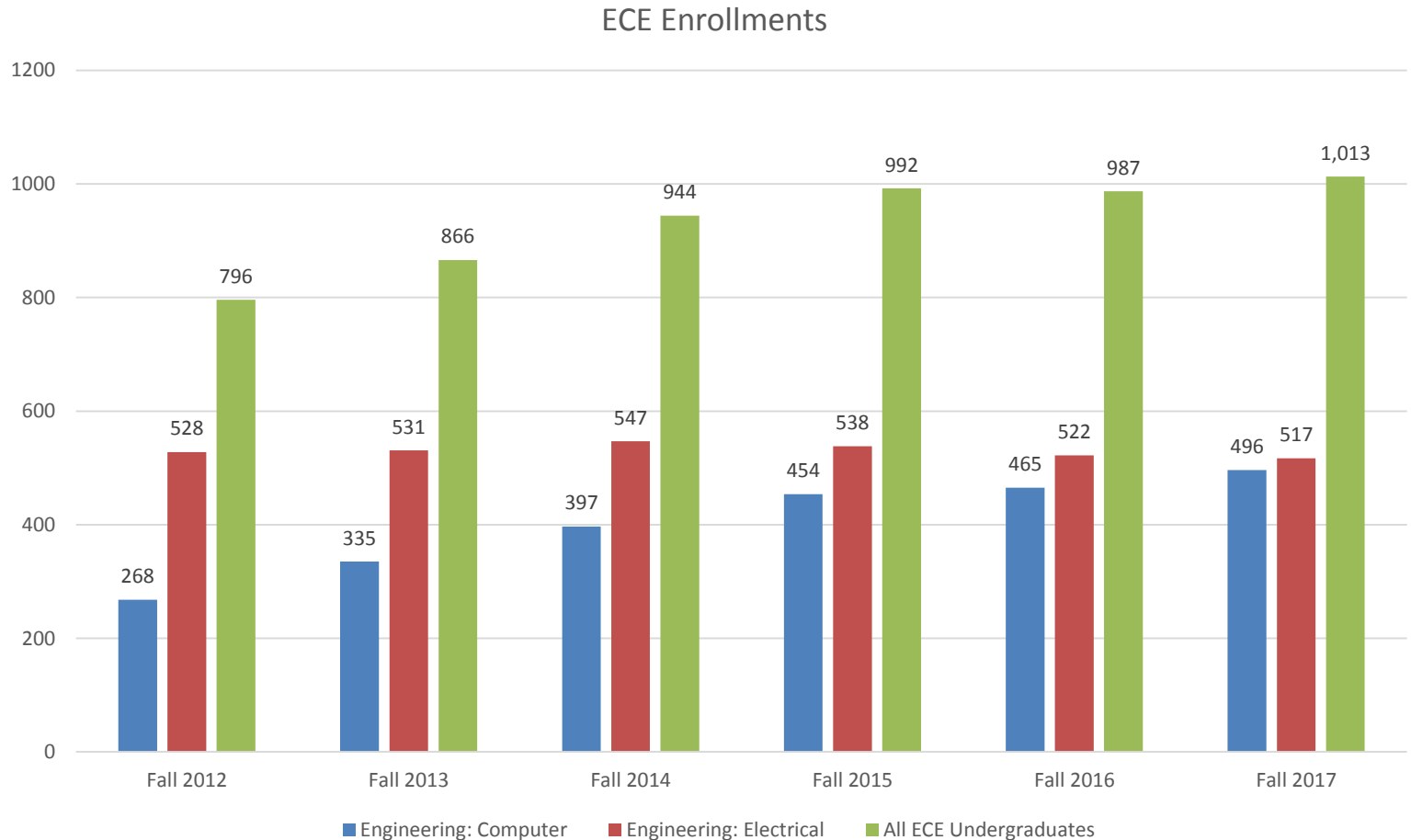- Freshman Welcome 2018

Graduation Numbers

- Fall 2017: 62 ECE students graduated in December.
- For Spring 2018: 173 ECE students have applied for May '18 graduation.

ECE Bachelor's Degrees (by Fiscal Year)

Fiscal Year	Degrees
FY2012	166
FY2013	170
FY2014	196
FY2015	171
FY2016	187
FY2017	225

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ECE Enrollments

- Fall 2017: reached 1,013 students, expected Fall 2018: 1050

ECE Enrollments

Legend: Engineering: Computer | Engineering: Electrical | All ECE Undergraduates

	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
Engineering: Computer	268	335	397	454	465	496
Engineering: Electrical	528	531	547	538	522	517
All ECE Undergraduates	796	866	944	992	987	1,013

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Tenured/Tenure Track Faculty Since 2011

C&SP

CpE

MicroE

E-Physics

Behtash Babadi

Dana Dachman-Soled

Kevin Daniels

Tudor Dumitras

Mohammad Hafezi

Alireza Khaligh

Jeremy Munday

Dinesh Manocha

Babis Papamanthou

Michael Rotkowitz

Yasser Shoukry

Phil Sprangle

15 New UG Courses Since 2011

ENEE101 Introduction to Electrical & Computer Engineering

ENEE351 Algorithms & Data Structures

ENEE408K Electric Cars

ENEE408L Electric Guitars

ENEE408R Electric Bikes

ENEE408T Accelerator Physics - Building the Maryland 5 MeV Cyclotron

ENEE439M Machine Learning

ENEE447 Operating Systems

ENEE456 Cryptography

ENEE457 Computer Security Systems

ENEE459B Reverse Engineering & Hardware Security

ENEE469O Intro to Optimization

ENEE476 Renewable Energy

ENEE489A Laboratory for Antennas for Wireless Personal Communication

ENEE489I Solar Energy Conversion

New UG Programs Since 2011

Computer Engineering Minor (Fall 2015)

Cybersecurity Specialization (Fall 2017)

Embedded Systems Major (Fall 2019)

Machine Learning Minor (Spring 2019)

Southern MD EE Major (Fall 2015)

New Programs/Centers Since 2011

Maryland Cybersecurity Center (created in 2010, implemented in 2011)

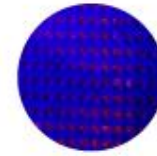Southern Maryland EE Program (Fall 17)

BS ES and IOT at Shady Grove (Fall 19)

New Laboratories Since 2011

The Jimmy Lin Advanced Microelectronics Lab (ENEE307)

The Hughes Network Communication Systems Lab (ENEE428)

The Texas Instrument Discovery Lab (ENEE101)

The last 7 years has been unprecedented in the progress made in the ECE Department.

EE Admissions and Enrollment

Requested College: A. James Clark School of Engineering
Requested Department: ENGR-Electrical & Computer Engineering
Requested Major: 09090 - Engineering: Electrical
NOTE: Lighter bars indicate students who were not admitted to the requested college, department, or major (depending on "Admitted To..." selection).

Electrical Engineering Admissions
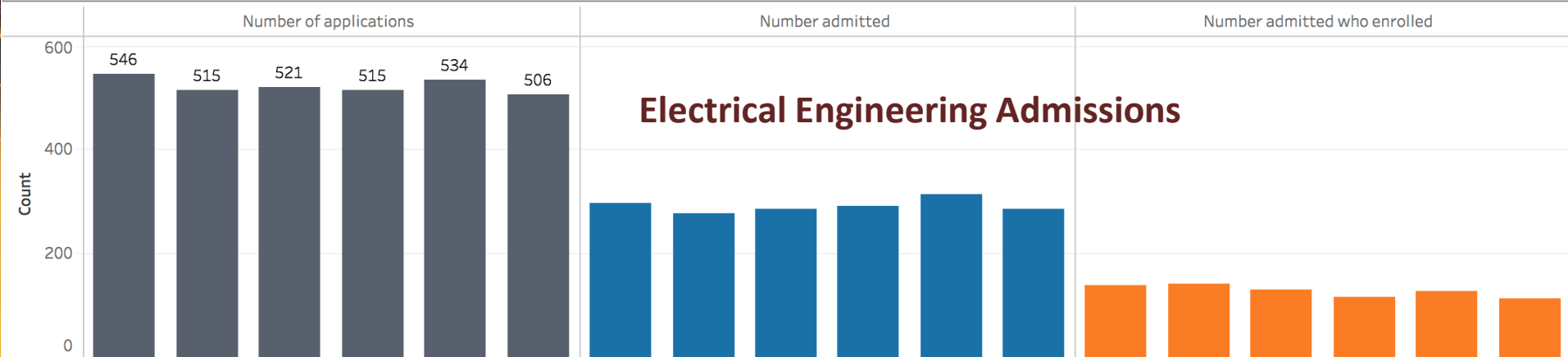
		Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
Admitted to the University	Number of Applications	546	515	521	515	534	506
	Number Admitted	297	278	285	291	314	285
	Number Enrolled	138	141	131	115	127	114
	Percent Admitted	54.4%	54.0%	54.7%	56.5%	58.8%	56.3%
	Percent Admitted who Enrolled	46.5%	50.7%	46.0%	39.5%	40.4%	40.0%
	Transfer GPA for Enrolled Students						

		Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
University Overall	Number of applications	33,584	33,949	33,640	35,572	38,018	41,206
	Percent admitted	45.6%	46.6%	48.7%	46.9%	49.1%	46.7%
	Percent admitted who enrolled	39.7%	39.5%	38.9%	37.6%	37.9%	34.2%
	Transfer GPA of enrolled students						

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CpE Admissions and Enrollment

Requested College: A. James Clark School of Engineering
Requested Department: ENGR-Electrical & Computer Engineering
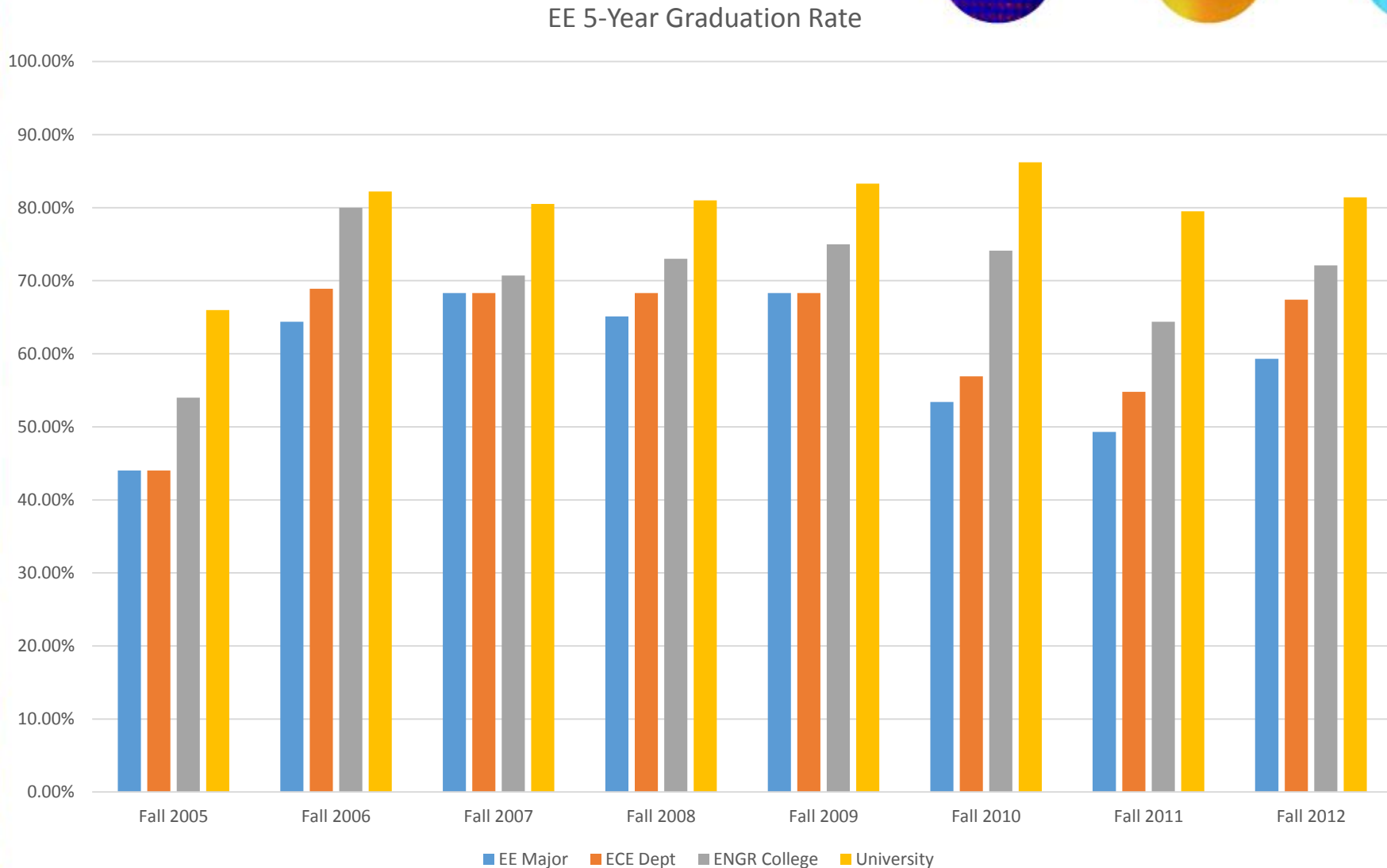**Requested Major:** 09991 - Engineering: Computer
NOTE: Lighter bars indicate students who were not admitted to the requested college, department, or major (depending on "Admitted To..." selection).
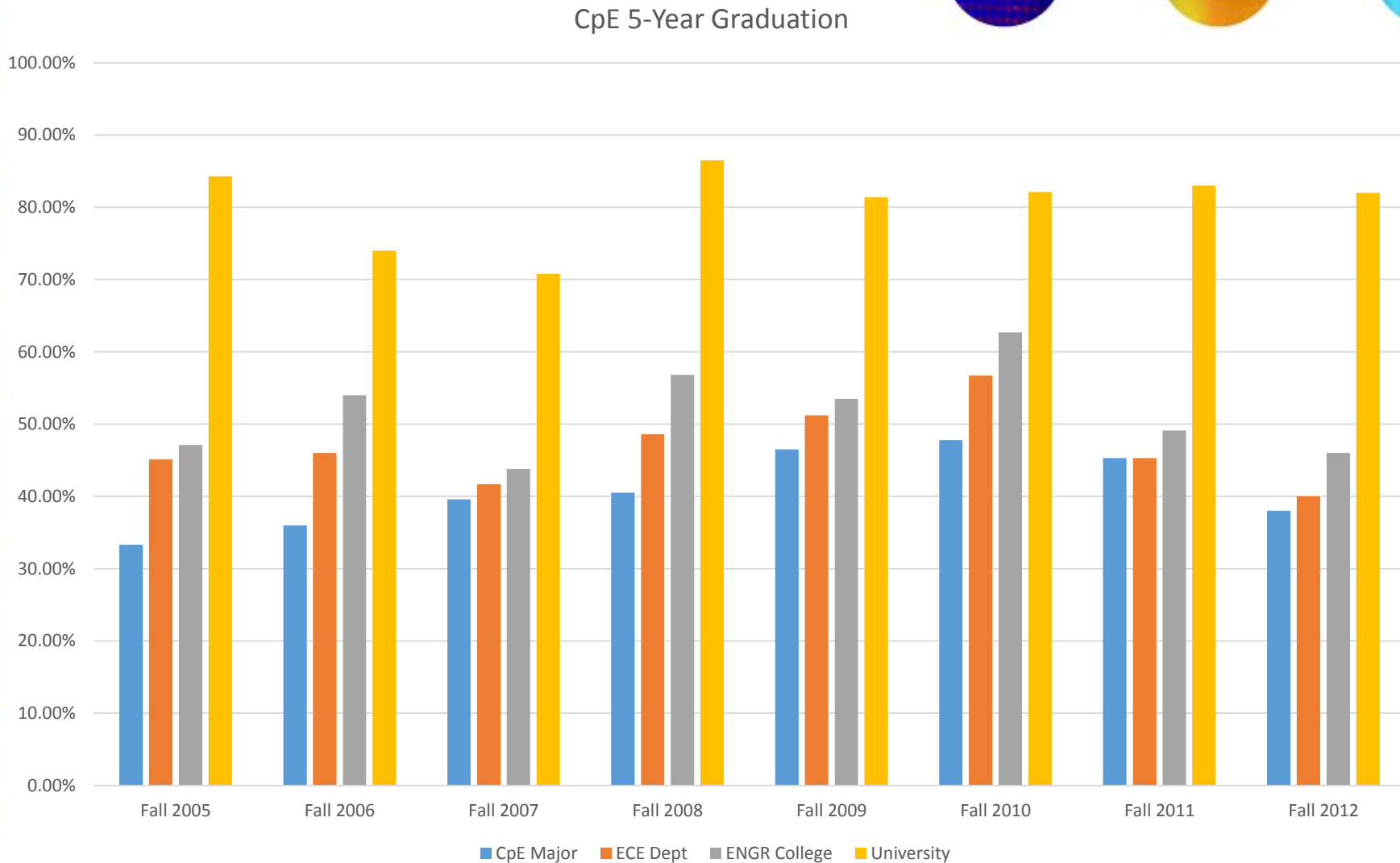

Computer Engineering Admissions

Admitted to the University		Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
	Number of Applications	540	632	663	747	833	1,017
	Number Admitted	257	322	367	366	437	578
	Number Enrolled	96	138	157	139	159	203
	Percent Admitted	47.6%	50.9%	55.4%	49.0%	52.5%	56.8%
	Percent Admitted who Enrolled	37.4%	42.9%	42.8%	38.0%	36.4%	35.1%
	Transfer GPA for Enrolled Students						

University Overall		Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
	Number of applications	33,584	33,949	33,640	35,572	38,018	41,206
	Percent admitted	45.6%	46.6%	48.7%	46.9%	49.1%	46.7%
	Percent admitted who enrolled	39.7%	39.5%	38.9%	37.6%	37.9%	34.2%

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EE 5 year Graduation Rate

EE 5-Year Graduation Rate

Legend: EE Major, ECE Dept, ENGR College, University

Years: Fall 2005, Fall 2006, Fall 2007, Fall 2008, Fall 2009, Fall 2010, Fall 2011, Fall 2012

CpE 5 year Graduation Rate

CpE 5-Year Graduation

Legend: CpE Major, ECE Dept, ENGR College, University

X-axis: Fall 2005, Fall 2006, Fall 2007, Fall 2008, Fall 2009, Fall 2010, Fall 2011, Fall 2012

Y-axis: 0.00% to 100.00%

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Improving Retention Rates for CpE

- Acting upon recommendations of Advisory Board
- Faculty Meeting on April 6, 2018 discussion to revise CpE curriculum to allow more flexibility
- Currently looking at prerequisites and details of implementation
- Faculty Buy-in

Currently Required   **CS Electives**   Math electives, Advanced labs, and Capstone omitted

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Essential:

CMSC 131 – Java I
CMSC 132 – Java II   CMSC 250 – Discrete Math   ENEE 205 – Circuits   ENEE 244 – Digital Logic
CMSC 216 – C   ENEE 245 – Digital Lab

                        CMSC 330 – Programming Languages   ENEE 222 – Signals I
                        CMSC 351 – Algorithms

                                                                          ENEE 350 – Computer Organization

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Important, but Flexible:

ENEE 303 – Analog Circuits

ENEE 307 – Analog Lab   ENEE 322 – Signals II ----> ENEE 324 – Probability

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Electives:

ENEE 411 – Adv Circuits   ENEE 425 – DSP   ENEE 420 – Comm.   ENEE 440 – Processors
ENEE 413 – Devices   ENEE 460 – Controls   ENEE 426 – Comm. Net   ENEE 457 – Security
ENEE 475 – Power   ENEE 463 – Digital Controls   ENEE 459P – Parallel
ENEE 476 – Renewable   ENEE 474 – Power Systems ENEE 439M – ML   Algorithms
                                                     ENEE 469O – Opt.   ENEE 459V – Embedded
                                                     Other ML Electives   Systems

                                                                                 ENEE 459I - CPS

CMSC 423 – Bioinformatics   CMSC 420 – Data Structures
CMSC 421 – AI   CMSC 451 – Adv. Algorithms   ENEE 446 – Architecture
CMSC 424 – Database   CMSC 452 – Theory   CMSC 412 – OS
CMSC 426 – Image Processing   CMSC 433 – Adv. PL   CMSC 430 – Compilers
CMSC 427 – Graphics   CMSC 417 – Networks
CMSC 434 – HCI

                                CMSC 474 – Game Theory
                                CMSC 475 – Graph Theory   CMSC 460 – Numeric Methods

BS ES and IoT at Shady Grove (Updates)

- Met with Provost on May 16, 2018 to discuss programs at Shady Grove for Base-Budget Funding
- In attendance:
  - Mary Ann Rankin, Provost;
  - Betsy Beise, Associate Provost for Academic Planning & Programs
  - Stewart Edelstein, Executive Director of the Universities at Shady Grove
  - Michelle Gordon Marcellino
    Director, College Park Programs at Shady Grove
  - Darryll Pines, Dean, A. James Clark
  - Rama Chellappa, Chair, ECE
  - John Fisher, Chair BioE
  - Mel Gomez, Associate Chair, ECE
- $0.9M will be proposed to USM for base-budget for BS ES and IoT
- Program start date AY2019

The Universities at Shady Grove campus buildings: 9630 Gudelsky Drive Building II, 9636 Gudelsky Drive Building III, 9640 Gudelsky Drive Building I

The Universities AT SHADY GROVE

Campus map: Shady Grove Adventist Hospital, Parking Lot 3, Parking Garage, Parking Lot 4, BLDG II #9630, BLDG III #9636, BLDG I #9640, Parking Lot 5, Parking Lot 2, Parking Lot 1, IBBR, Event Entrance, Event Parking, IBBR Parking Lot, Traville Gateway Drive, Darnestown Road, Gudelsky Drive, Shady Grove Road, Shady Grove Station (5.9 mi) I-270 Exit 8A/8B, Rockville Station (5.2 mi) I-270/I-495 Exit 6A/6B

Legend: Handicap Parking, Bicycle Rack, Electric Charging Station, Carpool, Motorcycle Parking, H Hospital, 270 Interstate Highway, Metro Station, Ride On Bus Stop, Shuttle-UM UMD Shuttle

BS ES and IoT Committee

- Curriculum Development Members/Advisers
  - Don Yeung, Prof.
  - Gang Qu, Prof.
  - Yasser Shoukry, Asst. Prof.
  - Ankur Srivastava, Prof.
  - Jeff McKinney, Director of IT Operations
  - Zoltan Zafar, Director of ENTS
  - Ron Zahavi, Chief IoT Strategist, Microsoft
  - Zoran Mladenovic, GM, Software Dev. Org. at TI
  - Bogdan Kosanovic, R&D Manager, TI
  - Rama Chellappa
  - Mel Gomez

BS ES and IoT: Program Objectives

- The program objective is to produce graduates that will be employed in computing and information technologies who will have
  - a solid foundation on the key emerging technologies of Internet of Things, its usage and future trends;
  - the ability to integrate devices into complete IoT systems;
  - an understanding of how internet of things fits within the wider context of information and communications technology
  - an understanding of the role of data analytics and cloud computing in an IoT system
- Tracks
  - Hardware
  - Software: Computation and Data Management
  - Security

BS ES and IoT Students

- Accepting students with 2 years College Prep and meets requirements for admission to A.J. Clark School of Engineering.

- Target Constituency: STEM majors from Community Colleges, Maryland Middle College Programs

- Gateway Requirements
  - Completion of MATH 141 with minimum grade of B- or better.
  - Completion of PHYS 161 with a minimum grade of B- or better.
  - Completion of either CHEM 135 or CHEM 271 or CHEM 134 with a minimum grade of C- or better. (Students who take CHEM 134 must also complete CHEM 131 with a C-).
  - Introductory Programming Course in C, Java, Python
  - Completion of 60 credits and all GenEd requirements

BS ES and IoT 3rd Year (Common) Curriculum

Junior Year 1st Semester

Course	Title	Cr
ENEE 302	Analog Circuits	4
ENEE 344	Introduction to Digital Circuits	4
ENEE 354	Discrete Mathematics and Applications	3
ENEE 340	Programming Concepts for Engineers (C/C++)	2
ENEE 341	Introduction to Internet of Things	3
	Total Semester Credits	16

Junior Year 2nd Semester

Course	Title	Cr
ENEE 304	Microelectronics and Sensors	3
ENEE 352	Introduction to Networks and Protocols	3
ENEE 353	Computer Organization	3
ENEE 355	Algorithms in Python	3
ENGL 393	Technical Writing	3
	Total Semester Credits	15

BS ES and IoT 4rd Year

Senior Year 1st Semester

Course	Title	Cr
ENEE 408x	Capstone Design Lab I	3
ENEE454	Embedded Systems	3
ENEE4xx	Senior Level Electives (based on track)	9
	Total Semester Credits	15

Senior Year 2nd Semester

Course	Title	Cr
ENEE408x	Capstone Design Lab II	3
ENEE443	Hardware/Software Security for Embedded Systems	3
ENEE4xx	Senior Level Electives (based on track)	9
	Total Semester Credits	15

BS ES and IoT Hardware Track

Status	Course	Title	Cr
Required	ENEE 444	Operating Systems for Embedded Systems	3
Required	ENEE 455	Advanced FPGA System Design Using Verilog	3
Elective	ENEE 453	Web Based Application Development	3
Elective	ENEE 451	Network Security	3
Elective	ENEE 345	Probability and Statistical Inference	3
Elective	ENEE 459Q	Machine Learning Tools	3
Elective	ENEE 459D	Database	3

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BS ES and IoT Computation and Data Management Track

| Status	Course	Title	Cr
Required	ENEE 444	Operating Systems for Embedded Systems	3
Required	ENEE 453	Web Based Application Development	3
Required	ENEE 345	Probability and Statistical Inference	3
Required	ENEE 459Q	Machine Learning Tools	3
Required	ENEE 452	Advanced Software for Embedded Systems-Connected Systems	3
Elective	ENEE 455	Advanced FPGA System Design Using Verilog	3
Elective	ENEE 451	Network Security	3

BS ES and IoT Security Track

Status	Course	Title	Cr
Required	ENEE 453	Web Based Application Development	3
Elective	ENEE 345	Probability and Statistical Inference	3
Elective	ENEE 459Q	Machine Learning Tools	3
Required	ENEE 452	Advanced Software for Embedded Systems-Connected Systems	3
Elective	ENEE 455	Advanced FPGA System Design Using Verilog	3
Required	ENEE 451	Network Security	3
Required	ENEE 444	Operating Systems for Embedded Systems	

Electric Bikes Capstone Spring 2018

- 30 ECE + 5 ME Students

- Projects: Solar Powered, Autotransmission, ABS, Autonomous Navigation, Auto Speed Control, Antitheft
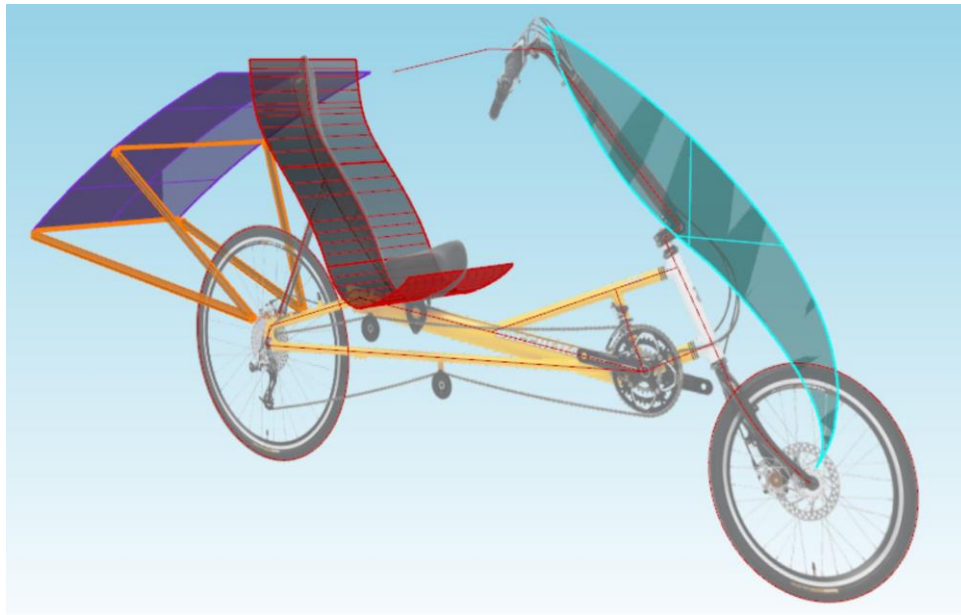
SOLAR POWERED E-BIKE

TERP

CAMPUS LIFE / HIGHLIGHTED / INNOVATION / TURN IMAGINATION INTO INNOVATION / MAY 8, 2018

Running On "E"

From left, electrical engineering seniors Majd Zaker, Israel Kinfu, Trevorne Nisbett and Vivek Mistry and mechanical engineering senior Patrick O'Shea test the transmission on the solar-powered bike they built.

Students Design and Build Electric Bikes in Engineering Course

BY **DANIEL OYEFUSI '19** | PHOTOS BY **STEPHANIE S. CORDLE**

As a student pedaled outside A. James Clark Hall on a solar-powered, two-wheeled contraption, engineering Professor Romel Gomez said, "In what

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Fall 2018 Freshman Student Welcome

- A new program by the ECE Undergraduate Office to welcome the ECE Freshman Class of 2022.

- We are expecting to have a freshman class of 150 students

- Goals:
  - Promote camaraderie within freshman class
  - Meet ECE advisors; go over academic expectations
  - Networking opportunities for incoming students

- Program will be held on Saturday, August 25, 2018 in Clark Hall.

- Sponsors are welcome for financial contribution (lunch, t-shirts), representatives to meet/speak with our students.