ABOUT THE INSTITUTE

The Electrical and Electronics Engineering Institute of the College of Engineering, University of the Philippines Diliman (UP EEEI) celebrated its one hundred years of honor and excellence in the fields of electrical, electronics, and computer engineering last 2016. From the establishment approval of the BS Electrical Engineering curriculum, leading to the establishment of the then Department of Electrical Engineering on 10 January 1916, which later became the Department of Electrical and Electronics Engineering in 1994, and Electrical and Electronics Engineering Institute in 2008, the UP EEEI continues to uphold its ideals as the premier institution for research and higher learning.

The Institute offers three undergraduate programs--Bachelor of Science in Electrical Engineering (BSEE), Bachelor of Science in Computer Engineering (BSCoE), and the Bachelor of Science in Electronics and Communications Engineering (BSECE) programs. In addition are four graduate programs namely Master of Science and Master of Engineering in Electrical Engineering; and the Doctor of Philosophy and Doctor of Engineering (Electrical and Electronics Engineering), which provide training and specialization to prepare students to solve complex technological problems and to contribute new knowledge to the field.

The Institute also houses 13 research laboratories, 14 instructional laboratories, and other learning facilities such as lecture rooms and meeting space which serve as venues for students and faculty members to engage in creative work and cutting-edge research.

VISION

To be the National Institute of Electrical, Electronics and Computer Engineering – internationally recognized; achieving national impact and global significance

MISSION

To produce innovative engineers who are committed to serve the nation; and to advance the field of electrical and electronics engineering

UNDERGRADUATE PROGRAMS

The Computer Engineering, Electrical Engineering, and Electronics and Communications Engineering undergraduate programs produce innovative engineers committed to serve the nation through the practice of the electrical and electronics engineering profession and its allied fields. The Bachelor of Science in Computer Engineering (BSCoE) program develops engineers who design and implement a broad spectrum of computing systems and components, ranging from integrated circuits, embedded systems, computer networks, and software applications. The Bachelor of Electronics and Communications Engineering (BSECE) program trains engineers who analyze, plan, design, measure, and operate electronic and communication devices and systems. The Bachelor of Science in Electrical Engineering (BSEE) program produces engineers who model, analyze, plan, design, measure, operate, and control electric power systems. These three undergraduate programs work closely together to provide students a unique opportunity for cross-curricular learning from all of these areas while pursuing specific undergraduate degrees, enabling them to understand new, complex and hybrid systems, and allowing graduates to rapidly adapt to the continuously-changing technology landscape.

The curricula for the BSCoE, BSECE, and BSEE programs may be found in pages 10-12 of this Catalogue, while undergraduate course offerings may be found on page 18.

GRADUATE PROGRAMS

Our graduate programs provide the country with a pool of highly qualified electrical and electronics engineers who carry out creative and challenging work in research, development, design, technology management and university instruction.

The Master of Science (MS) program is a research-oriented degree program targeted primarily at academics and researchers. Prospective students in this program intend to undertake research towards enhancing the delivery of higher education in academic institutions or the development of new technology in government and industry research institutions. MS students undergo coursework and get trained in research through immersion in research laboratories, and write a thesis documenting the findings and contributions from their research work.

The Master of Engineering (ME) program offers an advanced professional degree targeted primarily at industry practitioners and professionals. Prospective students in this program seek enhance their skills and knowledge for career advancement and towards supporting higher value engineering activities in their respective institutions. As such, the program supports the development of local engineering industry by enhancing the capability of its workforce to undertake higher value engineering work. ME students may flexibly tailor their coursework based on their learning or professional objectives: they may even opt to engage in research work, directed study, or project work within their program of study.

The Doctor of Philosophy (PhD) and Doctor of Engineering (DE) programs produce experts capable of conducting independent investigation and study, producing original contributions to the fundamental knowledge in the field (PhD), or solving engineering problems of substance and developing solutions in a creative and distinguished manner (DE). Doctoral students undergo an intensive program of study and research in exciting, cutting-edge areas of technology, and write a dissertation documenting their journey and findings from their investigation. Although the typical
entrance credential for admission into the doctoral programs is a master’s degree in a relevant field, admission is also possible for exceptional candidates who possess a relevant bachelor’s degree.

Curricula for the graduate programs may be found in pages 16-17 of this Catalogue, while graduate course offerings may be found in page 23.

RESEARCH AREAS AND LABORATORIES

The research areas of faculty members and students cover a wide range of topics which includes microelectronics, digital signal processing, software engineering, computer systems and networks, instrumentation and control, robotics, power electronics, power systems and renewable energy systems, among others. Below are the research laboratories, each with specific line of research interest:

UP-Analog Devices Microelectronics and Microprocessors Laboratories I and II (MicroLab)
Lab heads: Dr. Louis P. Alarcon and Dr. Ma. Theresa G. de Leon

The MicroLabs are used for research in the design and development of radio-frequency CMOS integrated circuits, analog/mixed signal systems, and low-power microprocessors.

UP-Artesyn Power Electronics Laboratory (PEL)
Lab head: Dr. Carl Michael F. Odulio

This laboratory serves as a training ground to expose students to the various fields of power electronics. PEL research areas include power supplies and converters, electric vehicle charging, electric motor drives, LED lighting, power amplifiers, battery technology, and electromagnetic compatibility.

Computer Networks Laboratory (CNL)
Lab head: Dr. Roel M. Ocampo

Research under this laboratory covers various rapidly-evolving aspects and applications of communication networks including but not limited to mobile systems, social networks, application-layer overlays, novel link/ routing/ transport protocols, cooperative community networks, low-overhead computing and networking, smart grids and smart homes, sensor networks, the Internet of Things (IoT), and big data.

Digital Signal Processing (DSP) Laboratory
Lab head: Engr. Michael Gringo Angelo R. Bayona

Research in the DSP Laboratory is geared towards DSP algorithm development and implementation. Areas of concentration include software and hardware embedded systems for real-time and non-real-time applications in audio, image, video and speech signal processing.

Electric Power Research Laboratory (EPRL)
Lab head: Dr. Allan C. Nerves

The EPRL is dedicated to research aimed at providing a safe, reliable, and optimum generation, distribution, conversion, measurement, and control of electric energy. Areas of concentration include modeling and simulation of electricity markets and power system dynamics; security assessment and stability enhancement for power systems in the restructured environment; and power system planning and optimal operation that ensure supply security, market competitiveness, and environmental sustainability.

Mobile Robotics (Mobot) Laboratory
Lab head: Engr. Percival D.C. Magpantay

This laboratory focuses on mobile robots and intelligence agents. Research thrusts include almost every aspect of electrical engineering, e.g. power electronics, instrumentation and control communications, embedded systems, artificial intelligence, and operating systems; and a little of computer science, mechanics, biology, and philosophy.

Innovation Research Center (IRC)
Lab head: Dr. Luis G. Sison

The research facility provides technology solutions in managing production resources, health care, and education. Its research thrusts are biomedical engineering; traffic, structural, and environmental monitoring; wireless sensor networks and embedded systems and mechatronics; and hardware interfaces for interactive learning.

Power Simulations Systems Laboratory (PSSL)
Lab head: Dr. Jordan Rel C. Orillaza

Research areas include modeling, simulation, and optimization of electric power systems (reliability); and planning, protection, automation, control and power quality. The lab is equipped with power system simulation software and hardware simulators such as power system micro-models fitted with protective relays, remote terminal units (RTUs), and supervisory control and data acquisition (SCADA).

Robotics Automation Laboratory (RAL)
Lab head: Dr. Manuel C. Ramos, Jr.

This laboratory focuses on robotic manipulators, bipeds, and autonomous navigation. Research topics under RAL may include, but not limited to manipulator dynamics, motor drives, sensor development, and autonomous vehicles.
Smart Grid Research Center (SGRC)
Lab head: Dr. Michael Angelo A. Pedrasa

Research areas include design and implementation of smart grid building blocks; control and communication solutions for smart grids; demand side management; integration of renewable and distributed energy resources to electric power systems; microgrids; virtual power plants; smart buildings and smart homes; and regulatory aspects and market operations for smart grid.

Solar Photovoltaics Laboratory (SPL)
Lab head: Dr. Lew Andrew R. Tria

As one of the leading research institutions for renewable energy research in the country, the SPL is continuously striving to develop, innovate, and promote novel energy technologies in order to uplift the quality of life for Filipino society and to safeguard the environment. Since its inception, the SPL has continually developed its expertise in many fields of renewable energy, advocates sustainable development, and the judicious use of energy resources through the implementation of its projects and programs.

Ubiquitous Computing Laboratory (UCL)
Lab head: Dr. Rowel O. Atienza

The UCL focuses on mobile, wearables and Internet of Things (IoT) research. This lab innovates on areas such as educational games (eg Animated Star Gram), human-device interaction (Slash the Fruit, Alien Antics and Holy Sheep!), virtual reality, animation, IoT protocols, and smart apps.

Wireless Communications Engineering Laboratory (WCEL)
Lab head: Engr. Neil Irwin M. Bernardo

The WCEL was established to provide instructional and training support, as well as to spearhead the research and development efforts of the Institute in the area of wireless communications technology. The lab primarily engages in the design, integration, analysis, and testing of wireless communication devices, circuits, and systems for various applications such as rural connectivity, emergency response, and public safety.

INSTRUCTIONAL FACILITIES

The Institute provides a wide range of facilities to support the instructional and research needs of its students, ranging from the 240-seater PLDT Multimedia Lecture Hall, numerous lecture rooms of various sizes, all the way down to meeting facilities for small group discussions. Students are also provided a number of areas for their own use where they can study, relax, or hold small discussions. Graduate students are also provided dedicated office spaces in addition to their work spaces in the laboratories.

The EEEI complements solid theoretical training with exposure and actual hands-on work in instructional laboratories on electronic components and circuits, embedded systems, communication systems, electric machines and motor drives, power system simulation, robotics and automation, prototyping, computer programming and computer networks. Many of these facilities are supported and endowed with state-of-the-art and industry-grade equipment by partners such as Alexan, Analog Devices, Artesyn, Intel, IXYS-Zilog, Meralco, PLDT, and Nokia, to name a few. These facilities ensure that students acquire sufficient practical skills in the design, implementation, operation and management of similar components or systems, making them "industry-ready" and well-prepared to solve engineering challenges out in the real world.

FACULTY AND STAFF

To date, the Institute has 48 full-time faculty members (9 on study leave), 27 lecturers, 1 Teaching Fellow, 4 Teaching Associates, and 7 regular staff.

Institute Director
John Richard E. Hizon

Professors

Rowena Cristina L. Guevara
Ph.D. Electrical Engineering (Systems), University of Michigan, 1997 rowena.guevara@eee.upd.edu.ph Digital Signal Processing for Audio, Music and Speech Signals

Joel Joseph S. Marciano, Jr.
Ph.D. Electrical Engineering, University of New South Wales, 2001 joel.marciano@eee.upd.edu.ph Wireless Communications, RF and Microwave Engineering

Allan C. Nerves
Ph.D. Electrical Engineering, Virginia Polytechnic Institute and State University, 1996 allan.nerves@eee.upd.edu.ph Power and Energy Systems, Electricity Markets

Manuel C. Ramos, Jr.
Ph.D. Electrical Engineering, Purdue University, 1998 manuel.ramos@eee.upd.edu.ph Control Systems, Nonlinear Control, Robotics, Fuzzy Systems

Luis G. Sison
Ph.D. Electrical Engineering, Purdue University, 1998 luis.sison@eee.upd.edu.ph Biomedical Engineering, Wireless Sensor Networks
Associate Professors

Anastacia B. Alvarez  
M.S. Electrical Engineering, University of the Philippines Diliman, 2004  
Ph.D. Electrical Engineering, National University of Singapore (in progress)  
anastacia.alvarez@eee.upd.edu.ph

Microelectronics, Computer Architecture, Digital Design and HDLs, Memory and Cache Design

Rowel O. Atienza  
Ph.D. Information Sciences Engineering, Australian National University, 2008  
rowel.atienza@eee.upd.edu.ph

Human-Machine Interface

Rhandley D. Cajote  
Ph.D. Electrical Engineering, Chulalongkorn University, 2011  
rhandley.cajote@eee.upd.edu.ph

Image and Video Processing, handwriting Recognition, Machine Vision, Stereo Imaging, Pattern Recognition

Rowaldo D. Del Mundo  
M.S. Electrical Engineering, University of the Philippines Diliman, 1991  
rowaldo.del.mundo@eee.upd.edu.ph

Power Systems, Electricity Markets and Regulation, Energy Planning

Roel M. Ocampo  
Ph.D. Electrical and Electronics Engineering, University College London, 2007  
roel.ocampo@eee.upd.edu.ph

Computer Networks

Jordan Rel C. Orillaza  
Ph.D. Electrical Engineering, University of Canterbury, 2013  
jordan.orillaza@eee.upd.edu.ph

Electric Power Quality, Power System Modeling and Analysis, Electrical machines

Michael Angelo A. Pedrasa  
Ph.D. Electrical Engineering, University of New South Wales, 2011  
michael.pedrasa@eee.upd.edu.ph

Smart Grids, Power Systems Operation and Control, Energy Systems Modeling

Marc Caesar R. Talampas  
Ph.D. Electrical and Electronics Engineering, Nanyang Technological University, 2017  
marc.talampas@eee.upd.edu.ph

Instrumentation, Embedded Systems, Environmental Monitoring, Wireless Sensor Networks

Nestor Michael C. Tiglao  
Ph.D. Electrical and Computer Engineering, Universidade Tecnica de Lisboa, 2013  
nestor.tiglao@eee.upd.edu.ph

Wireless Sensor Networks, Internet of Things

Assistant Professors

Louis P. Alarcon  
Ph.D. Electrical Engineering and Computer Science, University of California, Berkeley, 2010  
louis.alarcon@eee.upd.edu.ph

Microelectronics, Integrated Circuits, RF IC Design, Low-Power Processor Design

Adelson N. Chua  
M.S. Electrical Engineering, University of the Philippines Diliman, 2014  
adelson.chua@eee.upd.edu.ph

Microprocessor Design, Digital Systems Design

Paul Jason R. Co  
M.S. Electrical Engineering, University of the Philippines Diliman, 2005  
paul.co@eee.upd.edu.ph

RF and Antennas, Wireless Communications

Ivan Benedict Nilo C. Cruz  
M.S. Electrical Engineering, University of the Philippines Diliman, 2009  
ivan.cruz@eee.upd.edu.ph

Power System Planning, Energy System Planning

Franz A. De Leon  
Ph.D. Electrical and Electronics Engineering, University of Southampton, 2014  
franz.de.leon@eee.upd.edu.ph

Audio and Communications Signal Processing, Music Information Retrieval

Ma. Theresa G. De Leon  
Ph.D. Electrical and Electronics Engineering, University of Southampton, 2014  
theresa.de.leon@eee.upd.edu.ph

Microelectromechanical Systems, Energy Harvesting, Microfabrication Techniques, RF and Analog ICs, On-wafer Device Characterization

Paul Leonard Atchong C. Hilario  
Ph.D. Physics, University of the Philippines Diliman, 2014  
atchong.hilario@eee.upd.edu.ph

Photonics, Wavefront Engineering, Instrumentation Physics

John Richard E. Hizon  
Ph.D. Electrical Engineering, Imperial College London, 2011  
richard.hizon@eee.upd.edu.ph

RF IC Design, RISC Processors, Mixed Signal Circuits

Joy Alinda R. Madamba  
M.S. Electrical Engineering, University of the Philippines Diliman, 2005  
Ph.D. Electrical and Electronics Engineering,
University of the Philippines Diliman (in progress)
joy.madamba@eee.upd.edu.ph
*Computer Architecture, Digital IC Design*

**Rico Jossel M. Maestro**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2015
rico.maestro@eee.upd.edu.ph
*Microelectronics*

**Percival D.C. Magpantay**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2006
Ph.D. Electrical and Electronics Engineering,
University of the Philippines Diliman (in progress)
percival.magpantay@eee.upd.edu.ph
*Microcontrollers, Sensors, Mobile Robotics
Power Electronics, Electric Motor Drives*

**Bienvenido M. Malquisto, Jr.**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2006
Ph.D. Electrical and Electronics Engineering,
University of the Philippines Diliman (in progress)
bienvenido.malquisto@eee.upd.edu.ph
*Power System Protection, Automation and Control,
Power System Planning, Power Systems Simulations*

**Isabel A. Montes**
Ph.D. Electrical and Electronics Engineering,
University of the Philippines Diliman, 2016
isabel.montes@eee.upd.edu.ph
*Computer Networks*

**Carl Michael F. Odulio**
Ph.D. Electrical and Electronics Engineering,
University of the Philippines Diliman, 2016
carl.odulio@eee.upd.edu.ph
*Power Electronics, Electric Motor Drives*

**Jhoanna Rhodette I. Pedrasa**
Ph.D. Electrical Engineering,
University of New South Wales, 2010
jhoanna.pedrasa@eee.upd.edu.ph
*Computer Networks, Mobile Systems,
Smart Grid Communications*

**Niño Christopher B. Ramos**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2012
Ph.D. Electrical Engineering,
Osaka University (in progress)
nino.ramos@eee.upd.edu.ph
*Power Electronics, Renewable Energy Systems*

**Marc D. Rosales**
Ph.D. Electrical Engineering,
University of Paris - Est Marne-la-Vallee’, 2014
marc.rosales@eee.upd.edu.ph
*RFIC Design, Electronic Prototyping*

**Wilbert Rey D. Tarnate**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2013
Ph.D. Electrical Engineering,
RWTH Aachen University (in progress)
wilbert.tarnate@eee.upd.edu.ph
*Power Systems Reliability, Electricity Markets and Regulation*

**Adonis Emmanuel D.C. Tio**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2013
Ph.D. Electrical and Electronics Engineering,
University of the Philippines Diliman (in progress)
adonis.tio@eee.upd.edu.ph
*Power System Reliability, Energy Systems Modeling*

**Lew Andrew R. Tria**
Ph.D. Electrical Engineering,
University of New South Wales, 2017
lew.tria@eee.upd.edu.ph
*Power Electronics, Magnetic Design,
Photovoltaic Systems*

**Instructors**

**Nicolette Ann A. Arriola**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2015
nicolette.arriola@eee.upd.edu.ph
*Power Electronics, Solar Power*

**Michael Gringo Angelo R. Bayona**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2014
michael.bayona@eee.upd.edu.ph
*Speech Signal Processing, Synthesis and Recognition, Natural Language Processing*

**Neil Irwin M. Bernardo**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2016
neil.bernardo@eee.upd.edu.ph
*Wireless Communications*

**Gaudan Albert Chekov L. Castillo**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2014
chekov.castillo@eee.upd.edu.ph
*Power Electronics, Linear and Switched Mode Power Supplies, Electronic Motor Drives*

**Steven Matthew C. Cheng**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2017
steven.cheng@eee.upd.edu.ph
*Wireless Communications, TV White Space*

**Jaybie A. de Guzman**
M.S. Electrical Engineering,
University of the Philippines Diliman, 2013
Ph.D. Electrical and Electronics Engineering,
University of the Philippines Diliman, (in progress)
jaybie.de.guzman@eee.upd.edu.ph
*Computer Networks, Communications and Embedded Systems*
Dale Joshua R. del Carmen  
M.S. Electrical Engineering,  
University of the Philippines Diliman, 2017  
dale.del.carmen@eee.upd.edu.ph  
*Digital Image Processing*

Jasmin C. del Rosario  
B.S. Electronics and Communications Engineering,  
University of the Philippines Diliman, 2015  
M.S. Electrical Engineering,  
University of the Philippines Diliman (in progress)  
jasmin.del.rosario@eee.upd.edu.ph  
*Power Electronics, Solar Photovoltaic Systems*

Chris Vincent J. Densing  
M.S. Electrical Engineering,  
University of the Philippines Diliman, 2013  
chris.densing@eee.upd.edu.ph  
*Digital VLSI Circuits and Systems, Computer Architecture*

Russel John D.C. Gallano  
M.S. Electrical Engineering,  
University of the Philippines Diliman, 2014  
russel.gallano@eee.upd.edu.ph  
*Power System Dynamics and Stability, System Optimization, Microgrids*

Wilbert Jethro R. Limjoco  
M.S. Electrical Engineering,  
University of the Philippines Diliman, 2017  
jethro.limjoco@eee.upd.edu.ph  
*Computer Networks*

Crisron Rudolf G. Lucas  
B.S. Electronics and Communications Engineering,  
University of the Philippines Diliman, 2013  
M.S. Electrical Engineering,  
University of the Philippines Diliman (in progress)  
crisron.lucas@eee.upd.edu.ph  
*Speech Signal Processing*

Genedyn Gems S. Mendoza  
M.S. Electrical Engineering,  
University of the Philippines Diliman, 2017  
genedyn.gems.mendoza@eee.upd.edu.ph  
*Wireless Communications, RF Power Amplifiers*

Christopher G. Santos  
B.S. Electronics and Communications Engineering,  
University of the Philippines Diliman, 2013  
M.S. Electrical Engineering,  
University of the Philippines Diliman (in progress)  
christopher.santos@eee.upd.edu.ph  
*Microelectronics, Mixed Signal Circuits*

Teaching Associates  
Raven Karl R. Lubuguin  
B.S. Electronics and Communications Engineering,  
University of the Philippines Diliman, 2017  
M.S. Electrical Engineering,  
University of the Philippines Diliman (in progress)  
raven.lubuguin@eee.upd.edu.ph  
*Power Electronics, Power Supplies and Converters, Energy Storage*

Darvy P. Ong  
B.S. Computer Engineering,  
University of the Philippines Diliman, 2017  
M.S. Electrical Engineering,  
University of the Philippines Diliman (in progress)  
darvy.ong@eee.upd.edu.ph  
*Carl Timothy S. Tolentino (Teaching Fellow)*

Christian Angelo A. Yap  
B.S. Electrical Engineering,  
University of the Philippines Diliman, 2016  
M.S. Electrical Engineering,  
University of the Philippines Diliman (in progress)  
christian.yap@eee.upd.edu.ph  
*Power Systems*

Adjunct Professor  
Raymond C. Nuñez  
M.S. Computer Science,  
University of the Philippines Diliman, 2008  
Ph.D. Computer Science,  
University of the Philippines Diliman (in progress)  
raymond.nunez@eee.upd.edu.ph  
*Computer and Network Security*

Lecturers  
Luis M. Alarilla  
Ph.D. Electrical Engineering,  
Iowa State University, 1974  
luis.alarilla@eee.upd.edu.ph  
*Sukarno A. Ali*  
M. Community Development,  
University of the Philippines Diliman, 2001  
sukarno.ali@eee.upd.edu.ph  
*Joaquin Carlos F. Almirante*  
B.S. Electronics and Communications Engineering  
University of the Philippines Diliman, 2015  
joaquin.almirante@eee.upd.edu.ph  
*Charleston Dale A. Ambatali*  
B.S. Electronics and Communications Engineering
<table>
<thead>
<tr>
<th>Name</th>
<th>Degree and Field</th>
<th>University and Year</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of the Philippines Diliman, 2016</td>
<td>M.S. Electrical Engineering</td>
<td><a href="mailto:charleston.ambatali@eee.upd.edu.ph">charleston.ambatali@eee.upd.edu.ph</a></td>
<td></td>
</tr>
<tr>
<td>Ryan Albert G. Antonio</td>
<td>B.S. Computer Engineering</td>
<td>University of the Philippines Diliman, 2016</td>
<td><a href="mailto:ryanantonio@eee.upd.edu.ph">ryanantonio@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Christiensen D.C. Arandilla</td>
<td>B.S. Computer Engineering</td>
<td>University of the Philippines Diliman, 2010</td>
<td><a href="mailto:christiensen.arandilla@eee.upd.edu.ph">christiensen.arandilla@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Neil Christian D. Astrologo</td>
<td>B.S. Computer Engineering</td>
<td>University of the Philippines Diliman, 2015</td>
<td><a href="mailto:neil.astrologo@eee.upd.edu.ph">neil.astrologo@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Mark Jan C. Bangoy</td>
<td>B.S. Electronics and Communications Engineering</td>
<td>University of the Philippines Diliman, 2011</td>
<td><a href="mailto:mark.jan.bangoy@eee.upd.edu.ph">mark.jan.bangoy@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Sherry Joy Alvionne S. Baquiran</td>
<td>M.S. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2014</td>
<td><a href="mailto:alvionne.baquiran@eee.upd.edu.ph">alvionne.baquiran@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Mary Claire A. Barela</td>
<td>M.S. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2014</td>
<td><a href="mailto:claire.barela@eee.upd.edu.ph">claire.barela@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Bernalyn A. Decena</td>
<td>B.S. Electronics and Communications Engineering</td>
<td>University of the Philippines Diliman, 2017</td>
<td><a href="mailto:bernalyn.decena@eee.upd.edu.ph">bernalyn.decena@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Mar Francis D. de Guzman</td>
<td>M.S. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2016</td>
<td><a href="mailto:mar.de.guzman@eee.upd.edu.ph">mar.de.guzman@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Alberto B. de Villa</td>
<td>B.S. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2014</td>
<td><a href="mailto:albertodevilla@eee.upd.edu.ph">albertodevilla@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Calvin Artemis G. Hilario</td>
<td>B.S. Electronics and Communications Engineering</td>
<td>University of the Philippines Diliman, 2011</td>
<td><a href="mailto:calvin.hilario@eee.upd.edu.ph">calvin.hilario@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Aldrin Rolf S.P. Ison</td>
<td>B.S. Electronics and Communications Engineering</td>
<td>University of the Philippines Diliman, 2016</td>
<td><a href="mailto:aldrin.rolf.ison@eee.upd.edu.ph">aldrin.rolf.ison@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Ephraim Paolo S. Lizardo</td>
<td>B.S. Electronics and Communications Engineering</td>
<td>University of the Philippines Diliman, 2017</td>
<td><a href="mailto:ephraim.lizardo@eee.upd.edu.ph">ephraim.lizardo@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Lorelisa Ethel R. Luya</td>
<td>B.S. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2016</td>
<td><a href="mailto:lorelisa.ethel.luya@eee.upd.edu.ph">lorelisa.ethel.luya@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Raphael Nestor V. Mantaring</td>
<td>M.Eng. Computer and Systems</td>
<td>Rensselaer Polytechnic Institute, 1983</td>
<td><a href="mailto:chicho.mantaring@eee.upd.edu.ph">chicho.mantaring@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Kevin M. Martin</td>
<td>B.S. Electronics and Communications Engineering</td>
<td>University of the Philippines Diliman, 2015</td>
<td><a href="mailto:kevin.martin@eee.upd.edu.ph">kevin.martin@eee.upd.edu.ph</a></td>
</tr>
<tr>
<td>Aurelia C. Mechilina</td>
<td>Ph.D. Material Science and Engineering</td>
<td>University of the Philippines Diliman, (in progress)</td>
<td><a href="mailto:aurelia.mechilina@coe.upd.edu.ph">aurelia.mechilina@coe.upd.edu.ph</a></td>
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<tr>
<td>Miguel Alberto C. Mercado</td>
<td>B.S. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2016</td>
<td><a href="mailto:miguel.mercado@eee.upd.edu.ph">miguel.mercado@eee.upd.edu.ph</a></td>
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<tr>
<td>Jose Alfonso C. Miras</td>
<td>B.S. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2004</td>
<td><a href="mailto:alfonso.miras@eee.upd.edu.ph">alfonso.miras@eee.upd.edu.ph</a></td>
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<tr>
<td>Miro Jan Benedict G. Navarro</td>
<td>B.S. Electronics and Communications Engineering</td>
<td>University of the Philippines Diliman, 2015</td>
<td><a href="mailto:miro.navarro@eee.upd.edu.ph">miro.navarro@eee.upd.edu.ph</a></td>
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<tr>
<td>Martin S. Reyes III</td>
<td>M.S. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2017</td>
<td><a href="mailto:martin.reyes.iii@eee.upd.edu.ph">martin.reyes.iii@eee.upd.edu.ph</a></td>
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<tr>
<td>Alvin Joseph J. Tang</td>
<td>M.Eng. Electrical Engineering</td>
<td>University of the Philippines Diliman, 2016</td>
<td><a href="mailto:alvin.tang@eee.upd.edu.ph">alvin.tang@eee.upd.edu.ph</a></td>
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<tr>
<td>Alexis Czezar C. Torreno</td>
<td>B.S. Computer Engineering</td>
<td>University of the Philippines Diliman, 2016</td>
<td><a href="mailto:alexiscz@eee.upd.edu.ph">alexiscz@eee.upd.edu.ph</a></td>
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Support Staff

Sukarno A. Ali
Precision Instrument Technician
sukarno.ali@eee.upd.edu.ph

Veronica B. Centeno
Administrative Assistant
veronica.centeno@eee.upd.edu.ph

Ma. Dolores C. Pernia
University Research Associate
dolores.pernia@eee.upd.edu.ph

Amelia M. Yanzon
Administrative Officer
amelia.yanzon@eee.upd.edu

Junril H. Gases
Laboratory Technician
junrilgases@gmail.com

Cesar U. Regidor
Administrative Officer
cesar.regidor@eee.upd.edu.ph

Rogelio M. Lagahit, Jr.
Precision Instrument Technician
rogelio.lagahit@eee.upd.edu.ph

Address and Contact Information
Electrical and Electronics Engineering Institute
EEEI Building, Velasquez Street
University of the Philippines Diliman, Quezon City
1101
Telephone: +63-2 925 2958
           +63-2 981-8500 ext. 3300
Website:  http://www.eee.upd.edu.ph
Facebook page: https://www.facebook.com/upeeei/
Twitter account: https://twitter.com/upeeei
## UNDERGRADUATE PROGRAMS CURRICULA

### BACHELOR OF SCIENCE IN COMPUTER ENGINEERING, 2015

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**Total Number of Units = 184**

**Notes:**
- Effective AY 2010-2011: Total number of units = 181
- Kas 1 and FIl 40 satisfy the 6-unit Philippine Studies requirement
- Minimum of nine (9) units of English/Communication courses must be taken
- Except for Math 1, HUPE courses in the MST domain must NOT be under Physics, Chemistry, or Mathematics
- As a requirement for graduation, all students are required to take one (1) year program in one of the following components: (a) Military Training Service (ROTC); (b) Civic Welfare
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<th>Lect (hrs/wk)</th>
<th>Lab (hrs/wk)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEE 105</td>
<td>None</td>
<td>None</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>EEE 103</td>
<td>PI 100</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Total Number of Units = 183

### Notes:

1. Effective AY 2010-2011. Total number of units = 181
2. Kas 1 and FI 40 satisfy the 6-unit Philippine Studies requirement
3. Minimum of nine (9) units of English/Communication courses must be taken
4. As a requirement for graduation, all students are required to take one (1) year program in one of the following components: (a) Military Training Service (ROTC), (b) Civic Welfare
Training Service (CWTS); (c) Literacy Training Service

¹ CoE 111, 121, 123, 127, 129, 131, 133, 134, 141, 143, 153, 197; ECE 123, 129, 131, 133, 153, 155, 157, 159, 197
² Must have taken EEE 51, EEE 101, EEE 105, and EEE 107
GRADUATE PROGRAMS CURRICULA

Master of Engineering in Electrical Engineering (M.E. EE)

PROGRAM CHECKLIST

A. Required Major Courses\(^1\)  
   15 units

B. Elective Courses\(^2\)  
   14 units

C. Comprehensive Examination

D. Seminar Course
   • EE 296 Seminar  
      1 unit

TOTAL  
30 units

NOTES:  
1. Major Subject: Any creditable graduate-level EE course offered by the EEE Institute that is relevant to the area of specialization.
2. Elective: Any creditable graduate-level course that has been recommended for approval by the adviser and Institute graduate program committee; provided that all course prerequisites have been satisfied.

Master of Science in Electrical Engineering (M.S. EE)

PROGRAM CHECKLIST

A. Required Major Courses\(^1\)  
   14 units

B. Elective Courses\(^2\)  
   9 units

C. Thesis
   • EE 300  
      6 units

D. Seminar Course
   • EE 296 Seminar  
      1 unit

TOTAL  
30 units

NOTES:  
1. Major Subject: Any creditable graduate-level EE course offered by the EEE Institute that is relevant to the area of specialization.
2. Elective: Any creditable graduate-level course that has been recommended for approval by the adviser and Institute graduate program committee; provided that all course prerequisites have been satisfied.
Doctor of Engineering in Electrical and Electronics Engineering (D.E. EEE)
Doctor of Philosophy in Electrical and Electronics Engineering (Ph.D. EEE)

PROGRAM CHECKLIST

A. Major\(^1\) or Specialization\(^2\) Courses 24 units

B. Dissertation\(^3\)
   • EE 400 12 units

Notes:
\(^*\) For MS/ME degree holders
\(^1\)Major Course: Any creditable Electrical and Electronics Engineering graduate course relevant to the field / area of specialization
\(^2\)Specialization Course: Any creditable graduate course relevant to the field of specialization, pre-approved by the adviser and for which all prerequisites have been satisfied
\(^3\)The student must submit a 12-unit dissertation where s/he makes an original contribution to the fundamental knowledge in the field (PhD) or addresses an engineering problem of substance and develops a solution in a creative and distinguished manner (DE)
UNDERGRADUATE PROGRAMS COURSE DESCRIPTIONS

Computer Engineering (CoE)

23 Synthesis of Sequential Circuits. Minimization of synchronous sequential circuits; synthesis of synchronous sequential circuits using structured techniques; delays & hazards; asynchronous Huffman circuits; physical characteristics of logic gate implementations. Prereq: EEE 11, EEE 21, EEE 34. 5 h (2 lec, 3 lab). 3 u.

111 Advanced Digital Design. Combinational & sequential circuits; structured design; digital design using programmable devices; hardware description language (HDL)-based digital design; simulation; testing of digital circuits. Coreq: EEE 105. 5 h (2 lec, 3 lab). 3 u.


115 Introduction to Embedded Microcontrollers. Introduction to embedded microcontrollers in electronic and electromechanical systems. Hardware and software design techniques. System interfaces, data acquisition and control. High speed design techniques. Prereq: EEE 105. 5 h (2 lec, 3 lab). 3 u.

121 Introduction to Digital Signal Processing. Discrete-time systems in frequency domain; digital filter design; linear prediction & optimum linear filters. Prereq: EEE 25, EEE 35. 6 h (3 lec, 3 lab). 4 u.

123 Introduction to Digital Image & Video Processing. Digital image fundamentals; introduction to two-dimensional digital signal processing (DSP); image enhancements & restoration algorithms; image filters; image coding & compression; video coding & standards; some applications of video & image processing. Prereq: EEE 35. 6 h (3 lec, 3 lab). 4 u.

127 Audio & Speech Signal Processing. Fundamental audio synthesis concepts; advanced techniques of audio signal processing, analysis & modeling; engineering models for speech signal analysis, synthesis & recognition. Prereq: CoE 121. 5 h (2 lec, 3 lab). 3 u.

129 Real-Time Digital Signal Processing. Digital signal processor architectures; data converters; real-time concepts & programming; digital filtering; real-time spectral analysis. Prereq: CoE 121, EEE 105. 5 h (2 lec, 3 lab). 3 u.


134 Computer Systems Engineering II. Requirements analysis and elicitation. Architectural design. Implementation, testing and maintenance issues. Prereq: CoE 133. 4 h (1 lec, 3 lab) 2 u.


141 Introduction to Digital Integrated Circuit Design. Concepts, economics & trends of integrated circuits (IC); MOS transistor characteristics & models; basic digital building blocks; structured digital circuits & systems. Prereq: EEE 21, EEE 41. 6 h (3 lec, 3 lab). 4 u.

143 Introduction to Analog Integrated Circuit Design. IC fabrication processes; analog device modeling; circuit simulation; amplifiers, comparators & other analog systems. Prereq: EEE 51. 6 h (3 lec, 3 lab). 4 u.


197 Special Topics in Computer Engineering. Prereq: COI. 2-4 u. (any combination of lec or lab); may be repeated for additional credit provided that the special topic should be indicated for record purposes.

198 Special Problems in Computer Engineering. Prereq: Approved project proposal from EEE 190, research laboratory affiliation. 11 h (2 lec, 9 lab) 5 u.

Electronics & Communications Engineering (ECE)


117 Instrumentation Electronics. Sensors in control systems; signal conditioning; data acquisition systems; actuators & controllers; industry standards. Prereq: EEE 34, EEE 51. 5 h (2 lec, 3 lab). 3 u.

123 Digital Instrumentation & Control Techniques. A/D-D/A conversion; process control; fundamentals of robotics; data acquisition; real time applications. Prereq: EEE 101. 3 u.

129 Simulation & Control Laboratory. System modeling; computer-aided control system design & computer simulation; op amps as feedback compensators; DC motor dynamics & control; closed-loop control & responses to step & ramp inputs. Prereq: EEE 52/COI, EEE 101. 5 h (2 lec, 3 lab). 3 u.

131 Introduction to Robotics. Coordinate transformations; forward & inverse kinematics; manipulator dynamics; control of manipulators; path planning. Prereq: EEE 101, ES 12, ES 21/COI. 3 u.


141 Digital Communications. Sampling & quantization; baseband pulse transmission; multiplexing; digital modulation techniques; bit error rates & spectral efficiency; clock recovery; information theory & error control coding; spread spectrum modulation. Prereq: EEE 107. 5 h (2 lec, 3 lab). 3 u.

151 Communication Networks. Telephony; telephone traffic, switching & signaling systems; multiplexing; trunking theory; modem standards; optical communication systems; open systems interconnect (OSI) layers for communication systems. Prereq: EEE 107. 3 u.

153 Wireless Communications. Radiowave propagation; antenna basics; large-scale path loss models; small-scale fading; cellular & satellite communication systems; multiple access techniques; current topics of interest in wireless communications. Prereq: EEE 23; Coreq: ECE 141. 3 u.

155 Modern Audio Engineering. Fundamentals of sound & hearing; audio tests & measurements; electrical & environmental noise & noise reduction in audio systems; microphones & loudspeakers; audio processing electronics & acoustics; practical audio systems. Prereq: EEE 107. 5 h (2 lec, 3 lab). 3 u.

157 Microwave Engineering I. Review of electromagnetics; transmission line theory & wave-guides; the Smith chart; network analysis & port parameters; impedance matching; passive & active microwave circuits. Prereq: EEE 23, EEE 107. 3 u.

159 Microwave Engineering II. Microwave materials & processes; laminates; metals; solders; packaging; connectors; resistance, inductance, & capacitance (RLC) measurements; trans-mission lines; microstrip circuits; test & measurement equipment & software for microwave communication systems. Prereq: ECE 157, EEE 100. 5 h (2 lec, 3 lab). 3 u.

197 Special Topics in Electronics & Communications Engineering. Prereq: COI. 2-4 u. (any combination of lec or lab); may be repeated for additional credit provided that the special topic should be indicated for record purposes.

198 Special Problems in Electronics & Communications Engineering. Prereq: Approved project proposal from EEE 190, research laboratory affiliation. 11 h (2 lec, 9 lab). 5 u.
Electrical Engineering (EE)

121 **Introduction to Power Electronics.** Switching converter principles, harmonics, pulse-width modulation, phase control and phase modulation. Single-phase and three-phase rectifiers. AC voltage controllers, DC/DC converters and DC/AC inverters. Converter transfer functions. *Prereq:* EEE 42, EEE 53. 5 h (2 lec, 3 lab). 3 u.

123 **Electric Motor Drives.** Electric drive systems; steady-state analysis of direct current, induction, synchronous, & reluctance motor drives; efficiency, harmonics, & converter-motor interaction. *Prereq:* EE 121, EEE 43. 3 u.

143 **Electrical Machine Dynamics and Control.** Dynamic models and characteristics of electrical machines. Applications and control of direct-current, synchronous, induction and reluctance machines. *Prereq:* EEE 43. 3 u.

145 **Electrical Equipment and Devices.** Operating principles, characteristics and applications of transformers, switchgear, and other electrical equipment and devices used for power system protection and control. *Prereq:* EEE 43. 3 u.

146 **Electric Power Measurements & Equipment Characterization.** Power measurements. Performance evaluation and parameter measurement of electrical machines and transformers. *Prereq:* EEE 43, EEE 44, EEE 103. 3 h (3 lab) 1 u.


148 **Electrical Machine Design.** Design of transformers, rotating machines, and selected electrical equipment and devices. *Prereq:* EEE 143. 3 u.


157 **New Energy Systems.** Non-conventional energy resources & conversion technologies; new energy systems for off-grid applications; grid integration issues of non-conventional & new energy systems; planning & operations of electric power systems with intermittent energy systems. *Prereq:* EEE 103. 3 u.

158 **Electrical System Design.** Choice of systems & selection, arrangement & protection of components for power, lighting & auxiliary systems of residential, institutional, commercial, & industrial power systems; illumination design. *Prereq:* EEE 103. 5 h (2 lec, 3 lab). 3 u.

159 **Industrial Power Systems.** Selection & arrangement of electrical equipment for distribution, control, protection & metering in industrial plants, substations & modern power plants. *Prereq:* EEE 158. 5 h (2 lec, 3 lab). 3 u.

197 **Special Topics in Electrical Engineering.** *Prereq:* COI. 2-4 u. (any combination of lec or lab); may be repeated for additional credit provided that the special topic should be indicated for record purposes.

198 **Special Problems in Electrical Engineering.** *Prereq:* Approved project proposal from EEE 190, research laboratory affiliation. 11 h (2 lec, 9 lab). 5 u.
Electrical & Electronics Engineering (EEE)

1. **Essentials of Electrical & Electronics Engineering.** Analysis of alternating current (AC) & direct current (DC) circuits; motors & generators, characteristics & methods of control; diode & transistor circuits; current digital circuits & logic gates; transducers & transducer circuits; operational amplifiers; motor control; feedback control systems; introduction to digital control; programmable logic controllers. *Prereq:* ES 21/Math 121.1/equiv, Physics 72/102. 6 h (3 lec, 3 lab). 4 u.

2. **Elementary Electrical Engineering.** Fundamentals of electric & magnetic circuits; transformers; direct & alternating current machinery; elementary distribution systems & electrical wiring. *Prereq:* Math 54, Physics 72. 3 u.

3. **Industrial Electronics and Equipment.** Electrical measurements and some of their industrial applications. Operating principles, characteristics and application of electrical equipment. Equipment and devices used for system protection and control. Applications in power and industrial systems. Modern control devices in industry. *Prereq:* EEE 1 or EEE 3. Credits: 5 h (2 lec, 3 lab). 3 u.

4. **Introduction to Semiconductor Devices and Circuit Theory.** Elementary circuit analysis; semiconductor devices; introduction to transducers, operational amplifiers, and digital design. *Prereq:* Math 54, Physics 72, Physics 72.1. 6 h (3 lec, 3 lab). 4 u.


9. **Electromagnetic Fields I.** Vector analysis; steady electric and magnetic fields; dielectric and magnetic materials; time-varying fields. Maxwell’s equations; introduction to uniform plane waves & transmission lines; applications to electrical engineering. *Prereq:* Physics 72; *Coreq:* Math 55. 4 u.

10. **Probability & Statistics for Electrical & Electronics Engineers.** Review of descriptive statistics; combinatorial probability; single & bivariate random variables; expectation; sum of two independent random variables; introduction to estimation; introduction to random processes. *Prereq:* Math 55. 3 u.


13. **Electrical Measurements Laboratory.** Laboratory procedures & practice; data collection & analysis; laboratory documentation; standard electric instruments & circuits; basic electric circuit behavior; transducers. *Coreq:* EEE 33. 3 h (lab) 1 u.

14. **Signals and Systems.** Mathematical modeling of signals and systems. Continuous- and discrete-time signals. System analysis techniques and their applications to electric and electronic circuits, filter design, communications, control and signal processing. Linear time-invariant (LTI) systems. Frequency domain
representation of signals and system transfer functions. Two-port networks. Fourier-, Laplace- and Z-
transforms. Prereq: Math 54, EEE 11, EEE 33. 6 h (3 lec, 3 lab). 4 u.

41 **Introduction to Semiconductor Devices and Circuits.** Semiconductor devices: diodes, bipolar junction
transistors, field effect transistors; device models & circuit applications; regions of operation; large & small signal
modeling & analysis; semiconductor theory. Prereq: EEE 23, EEE 33, 3u

42 **Semiconductor Devices and Circuits Laboratory.** Characteristics, parameters, & non-idealities of actual
diodes, bipolar junction transistors (BJTs) & field effect transistors (FETs); basic circuit applications. Prereq:
EEE 34; Coreq: EEE 41. 3 h (lab) 1 u.

43 **Electromechanical Energy Conversion.** Basic principles; generalized machine model; direct current,
synchronous & induction machines. Prereq: EEE 23, EEE 33. 3 u.

44 **Electrical Machine Operation and Control.** Operation and control of rotating machines. Motor and generator
control devices and circuits. Programmable logic controllers. Prereq: EEE 34, Coreq: EEE 43, (3 lab) 1 u.

Prereq: EEE 41. 3 u.

52 **Electronic Circuits Laboratory I.** Performance measurements & behavior analysis of analog circuits. Prereq:
EEE 42; Coreq: EEE 51. 1 u.

53 **Electronic Circuits II.** Active switching circuits. Waveshaping circuits. Pulse and digital circuits. Analog and
digital circuit building blocks. Linear and switch-mode regulators. Prereq: EEE 21, EEE 41. 3 u.

54 **Electronic Circuits Laboratory II.** Construction, performance measurements and behavior analysis of pulse,
wave-shaping, timing and digital circuits. Prereq: EEE 42; Coreq: EEE 53. 3 h (3 lab). 1 u.

100 **Electronic Circuits Prototyping Laboratory.** Basic prototyping skills for electronic circuits including soldering,
schematic design entry, printed circuit board (PCB) layout and routing, PCB fabrication. Safe laboratory
practices. Computer aided design tools. Overview of industrial prototyping processes and standards. Prereq:
ES 1, EEE 42. 3 h (3 lab). 1 u.

101 **Control Systems Theory.** Continuous & discrete systems; open & closed loop systems; transfer functions;
block diagrams. Signal flow graphs; state variables; state transition matrix; stability; controllability &
observability. Prereq: ES 12, EEE 35; Coreq: EEE 41. 3 u.

103 **Introduction to Electric Power Systems.** Electric power industry. Power system compo-
nents and system
23, EEE 33. 3 u.

105 **Computer Organization.** Instruction sets. Computer arithmetic. Datapath and control. Memory system
organization and architecture. Interfacing and communication. Assembly language programming. Prereq: EEE
11, EEE 21, EEE 41. 6 h (3 lec, 3 lab). 4 u.

107 **Introduction to Communication Systems.** Signals & spectra; noise & distortion; trans-
mision, reception, &
detection; continuous-wave modulation & baseband digital pulse modulation; examples of practical
communication systems. Prereq: EEE 25, EEE 34, EEE 35. 5 h (2 lec, 3 lab) 3 u.

190 **Project Proposals, Inspection Trips, & Seminars.** Project proposal documentation & presentation; visits to
companies, factories, & electrical power plants; seminars on topics such as research, technical writing,
presentation skills, career planning, engineering ethics, & technopreneurship. Prereq: SS, research laboratory
affiliation. 4 h (1 lec, 3 lab). 2 u.

REVITALIZED GENERAL EDUCATION COURSE

**Electrical & Electronics Engineering (EEE)**

10 **Everyday EEE: Kuryente, Radyo, atbp.** Electrical & electronics engineering in everyday life. 3 u.
GRADUATE PROGRAMS COURSE DESCRIPTIONS

EE 212 Linear System Theory. Theory and application of discrete and continuous-time linear dynamical systems. Review of applied linear algebra; least-norm and least-squares methods. Autonomous linear dynamical systems; interpretations of eigenvalues, eigenvectors, matrix exponential, and invariant sets. Singular value decomposition with applications. Linear dynamical systems with inputs and outputs; transfer matrices. Observability and state estimation; controllability and state transfer. Examples and applications from digital filters, circuits, signal processing, and control systems. Prereq: EEE 35 and Math 114 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 221 Electronic Amplifier Design. Linear and non-linear models of field-effect and bipolar junction transistors at low and high frequencies; theory, design and application of class A, B, C, D, E, F amplifiers, wide band low-pass amplifiers, distributed amplifiers, power amplifiers, tuned amplifiers, feedback amplifiers, operational amplifiers, parametric amplifiers, sense amplifiers, and other special amplifiers; biasing; gain-bandwidth; noise mechanisms and low-noise design; passive components; performance evaluation and optimization; integrated circuit implementations; design projects. Prereq: COI. 4 u.


EE 227 Modern VLSI Design. Digital systems and VLSI. Transistors and layout. Logic functions. Combinational logic networks. Sequential machines. Systems architecture design and HDLs. Subsystem design and IP components. CAD systems and algorithms. Prereq: EEE 21 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 233 Digital Control Systems Design. Z-transforms and state variable representation of discrete-time systems; models for mixed continuous and discrete-time systems; modeling asynchronous sampling; analysis and design by root locus, frequency response, and state-space techniques; controllability, observability and observer design; linear quadratic optimal control and state estimation; optimization and design issues of mixed continuous and discrete-time systems; inter sample behavior; robust control; sampling rate selection; effects of quantization and finite precision errors; multi-variable control and optimization; multirate systems; computer simulations; design projects. Prereq: EEE 101 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 240 Power Electronics I. Application of semiconductor devices and circuits to power systems; power control, conditioning, processing and switching. Prereq: EEE 53 or equiv. 5h (2 lec, 3 lab) 3u.

EE 241 Linear and Switching Power Supplies. Linear converters. Switchmode topologies. DC/DC, AC/DC, DC/AC converters. Applications. Power supply simulation. Prereq: EEE 53 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 245 Advanced Theory of Electrical Machines. Reference frames and generalized machine theory. Modeling and analysis of rotating machines during steady state, transient, and dynamic conditions. Prereq: EEE 43 or equiv. 3 u.


EE 248 Power Amplifiers. Linear amplification. Voltage and current mode amplifiers. Amplifier classes A, B, AB, C. Trans-conductance amplifiers. Composite amplifiers. Resonant and switchmode amplifiers. Prereq: EEE 53 or EE 121 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 249 Power Electronics II. Principles of steady state converter analysis. Steady state equivalent circuit modeling. Converter circuits. AC circuit modeling. Converter transfer functions. Prereq: EE 240 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 251 Fault Studies. Symmetrical components. Sequence impedances of transmission lines, synchronous machines and transformers. Phase-domain and sequence-domain analysis of unbalanced and simultaneous faults.
Prereq: EEE 103 or equiv. 5h (2 lec, 3 lab) 3 u.

**EE 252 Load Flow Analysis.** System modeling and matrix analysis of balanced and unbalanced three-phase power systems. Solution of a system of linear and nonlinear equations. Solution of a system of linear and non-linear equations. Sparsity techniques and optimal ordering. Load flow of balanced and unbalanced three-phase power systems. Prereq: EEE 103 or equiv. 5h (2 lec, 3 lab). 3 u.


**EE 256 Power System Protection.** Fundamental principles. Selection and application of protective devices and protection algorithms. Protection of transmission lines, transformers, generators, motors, buses, and other equipment. Phase and ground fault protection. Coordination of protective devices. Testing of relays and protection algorithms. Prereq: EEE 103 or equiv. 5 h (2 lec, 3 lab) 3u..


EE 270 Digital Communications I. Methods of digital modulation and demodulation. Signal space methods in digital communications. Communication over AWGN and band-limited channels, including channel capacity. Carrier and symbol synchronization. Source coding and lossless compression. Channel coding, including block codes, convolutional codes and Viterbi decoding. Current topics of interest. Prereq: EEE 107 or equiv. 5 h (2 lec, 3 lab) 3 u.


processing. Wavelets and image compression. Morphological image processing. Image segmentation, representation, and description. Introduction to object recognition and computer vision. Advanced topics and applications of image processing analysis. Prereq: CoE 121 or EE 274 or COI. 3 u.


**EE 286 Digital Audio Signal Processing.** Digital audio signal analysis and manipulation. Speech and musical instrument synthesis. Digital audio recording and reproduction. EEE 35 and EEE 11, or COI. 5 h (2 lec, 3 lab) 3 u.

**EE 290 Directed Studies.** Independent study or investigation of directed, current research areas in electrical and electronics engineering. Collaborative peer discussions of study results and findings. Prereq: COI. 3 u.

**EE 296 Seminar.** 1 u. per sem; max. of 3 u.

**EE 298 Special Problems.** Course may be repeated for credit, up to a maximum of 12 units, provided that topics are different; topics to be indicated for record purposes. 3 u

**EE 299 Electrical Engineering Project.** Prereq: COI. 3 u.

**EE 300 Thesis.** 3 u. to 6 u.

**EE 317 Mathematical Methods for Electromagnetics I.** Analytical and numerical methods of solving practical problems in electromagnetics, including fundamental theorems, plane wave functions, cylindrical wave functions, variational techniques, geometric theory of diffraction, method of moments, finite difference time domain method and Galerkin's method. Computer programming exercises. Prereq: EE 217 and ES 204. 3 u.

**EE 318 Mathematical Methods for Electromagnetics II.** Variational techniques, geometric theory of diffraction, Galerkin's method, finite difference time domain method, method of moments; recent topics of interest; computer programming exercises. Prereq: EE 317. 3 u.

**EE 320 Analysis and Design of High Performance Digital Integrated Circuits.** Parasitic models and second-order effects of field-effect and bipolar transistors, and interconnects; clock skew and other timing issues; design of high-performance combinational and sequential logic circuits; arithmetic and memory structures and devices; charge-coupled device circuits; signaling, synchronization, noise and clock and power distribution issues; extraction of circuit parameters from process parameters; optimization at the device and circuit levels; circuit-systems issues; design projects. Prereq: EE 226 Co-req; EE 325. 4 u.

**EE 322 Analysis and Design of Monolithic Information Processing and Communication Circuits.** Small and large-signal models of field-effect and bipolar transistors; amplifiers, switched capacitor networks, sample and hold, multiplexers, analog to digital and digital to analog converters, active filters, comparators, analog multipliers, relaxation oscillators, phase detectors, phase-locked loops, voltage-controlled oscillators, mixers, sampled-data filters, digital decimation and interpolation filters; charge-coupled device circuits; architectural and circuit level performance evaluation; design projects. Prereq: EE 220. Co-req; EE 325. 4 u.

**EE 325 Semiconductor Devices II.** Compound semiconductors and hetero-junctions; dielectric and optical properties; optical processes; physics and models of high-frequency, high-speed and optoelectronic devices including HFET, HBT, MESFET, quasi-ballistic transistors and other sub-micron transistor concepts, and charge-coupled devices. Prereq: EE 225. 3 u.

**EE 326 Optoelectronic Devices.** Optical properties and processes; optical detectors, light-emitting diodes, solar cells, modulators, switches, directional couplers, lasers and others of interest. Prereq: EE 325. 3 u.

**EE 327 Advanced VLSI Design.** Advanced VLSI technologies; system architecture; system behavior modeling in
VHDL or C; CAD tools for standard cell, custom design or hybrid techniques; integration of heterogeneous CAD tools; automated and manual synthesis; advanced circuit design and testing methods; synthesis of the different levels of design hierarchy; design projects. Prereq: EE 227. 3 u.

EE 330 Optimal Control. Theoretical methods in optimal control theory. Topics include the review of the optimality conditions: Lagrange and Kuhn-Tucker. The calculus of variations and the Pontryagin minimum principle with applications to minimum energy problems. Geometric methods will be applied to the solution of minimum time problems. Computational methods, singular problems, observer theory, and sufficient conditions for existence of solutions are also discussed. Prereq: EE 212. 3 u.


EE 359 Power Systems Operation and Control. Modern power system operational and control problems and solution techniques, including load frequency control, automatic generation control, system voltage control, security assessment, state estimation, and contingency analysis. System control centers. Interconnected systems. Prereq: EEE 103 or equiv. 3 u.


EE 371 Microwave Integrated Circuits I. Computer-aided analysis and design of distributed circuit structures and their applications in passive and active microwave circuits including dividers, directional couplers, circulators, filters, transistor amplifiers, attenuators; experimental characterization; design projects. Prereq: EE 271 and EE 325. 3 u.

EE 372 Microwave Integrated Circuits II. Computer-aided analysis and design of distributed circuit structures and their applications in passive and active microwave circuits including transistor amplifiers, mixers, modulators, demodulators, oscillators, frequency converters, phase shifters, harmonic generators; noise models and low-noise design; monolithic MIC; fabrication processes of monolithic circuits; experimental characterization; design projects. Prereq: EE 371. 3 u.


EE 398 Special Problems. 3 u.

EE 400 Dissertation. 12u
<table>
<thead>
<tr>
<th>OFFERING UNIT</th>
<th>COURSE CODE &amp; NUMBER</th>
<th>COURSE TITLE</th>
<th>COURSE DESCRIPTION</th>
<th>CREDIT UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPEPP</td>
<td>Araling Kapampangan 10</td>
<td>Meken Abe: Pangkalahatang Sarbey ng Kulturang Kapampangan</td>
<td>Isang pangkalahatang pagtinside sa kultura ng rehiyon ng Pampanga kaugnay ang kasaysayan, panitikan, sining at sosyolohiya na nakapaloob dito.</td>
<td>3</td>
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<tr>
<td>CAL, UPEPP</td>
<td>Eng 1&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Basic College English</td>
<td>Basic grammar, usage &amp; composition skills in English.</td>
<td>3</td>
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<tr>
<td>CAL</td>
<td>Phil Stud 12&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Suroy--suroy sa Wika, Panitikan at Kultura sa mga isla ng Luzon, Visayas at Mindanao.</td>
<td>Mga panimulang pag--aaral ng mga wika, panitikan at kultura sa Pilipinas at ang kaugnayan at ambag nilo sa kalinanging pambansa sa kapuluan.</td>
<td>3</td>
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<tr>
<td>CAL</td>
<td>Art Stud 1</td>
<td>Art &amp; Society</td>
<td>Critical exploration of the arts in dynamic interaction with society.</td>
<td>3</td>
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<tr>
<td>CAL</td>
<td>Art Stud 2</td>
<td>Art Around Us: Exploring Everyday Life</td>
<td>3</td>
<td></td>
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<tr>
<td>CAL</td>
<td>Comm 3</td>
<td>Practical Speech Fundamentals</td>
<td>Speaking &amp; listening skills &amp; their applications in various communication situations.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>CW 10</td>
<td>Creative Writing for Beginners</td>
<td>A workshop exploring the potentials of creative writing as expression, as discipline &amp; as a way of thinking about the society in which we live.</td>
<td>3</td>
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<tr>
<td>CAL UPEPP</td>
<td>Eng 1&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Basic College English</td>
<td>Basic grammar, usage &amp; composition skills in English.</td>
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<td>CAL</td>
<td>Eng 10&lt;sup&gt;1a&lt;/sup&gt;</td>
<td>College English</td>
<td>The writing &amp; critical reading of forms of academic discourse essential to university work.</td>
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<tr>
<td>CAL</td>
<td>Eng 11</td>
<td>Literature &amp; Society</td>
<td>The study of various literary genres as a dynamic interaction between the individual &amp; social &amp; cultural forces.</td>
<td>3</td>
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<tr>
<td>CAL</td>
<td>Eng 12</td>
<td>World Literatures</td>
<td>The study of representative/landmark texts from the literatures of the world.</td>
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<tr>
<td>CAL</td>
<td>Eng 30&lt;sup&gt;4&lt;/sup&gt;</td>
<td>English for the Professions</td>
<td>Principles &amp; uses of writing in English in the various disciplines/professions.</td>
<td>3</td>
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<tr>
<td>CAL</td>
<td>EL 50&lt;sup&gt;4&lt;/sup&gt;</td>
<td>European Cultures &amp; Civilizations</td>
<td>Europe’s contributions to world cultures civilizations, &amp; languages.</td>
<td>3</td>
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<tr>
<td>CAL</td>
<td>Fil 25</td>
<td>Mga Ideya at Estilo</td>
<td>Mapanuring pag--aaral ng mga ideya at estilosa mga piling sanaysay sa agham at sining mula sa Pilipinas at iba pang bansa.</td>
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</tr>
<tr>
<td>CAL</td>
<td>Fil 40&lt;sup&gt;2,4&lt;/sup&gt;</td>
<td>Wika, Kultura at Lipunan</td>
<td>Ang relasyon ng Filipino sa kultura at lipunan Pilipino.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Humad 1&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Panitikan, Tao at Lipunan Pilipino</td>
<td>Ang pag-aaral ng iba't-ibang anyong pampatikahan bilang malikhain pahayag ng mga indibidwal na karanasan at mga pagsasalita at mithin ng lipunan Pilipino.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Kom 1</td>
<td>Kasanayan sa Komunikasyon</td>
<td>Paglinang sa kakayahang magpahayag sa wikang Filipino na nakatuon sa mabasa at mapanuring pagbasa, pakikinin at pagulat.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Kom 2</td>
<td>Kasanayan sa Komunikasyon</td>
<td>Paglinang sa kasanayan sa paggamit ng wikang Filipino sa higit na mapanuring pag-isip at masinop na pananaliksik.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>MPs 10&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Ang Hiwaga at Hikayat ng Panulat sa Filipino</td>
<td>Malikhaing pagbasa at masining na pagulat ng mga natatanging anyong pampatikan, kasama ang mga makabagong anyong teknolohikal.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Pan Pil 12&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Text Mo/Text Ko: Panimulang Pag-aaral ng Panitikang Pilipino</td>
<td>Mga Panimulang pag-aaral sa panitikan ng Pilipinas, mula sa tradisyunal na anyo hanggang sa mga teksito mula sa kulturan popular.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Pan Pil 17&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Panitikan at Kulturan Popular</td>
<td>Ang relasyon ng panitikan at popular na kultura sa kasalukuyan.</td>
<td>3</td>
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<tr>
<td>OFFERING UNIT</td>
<td>COURSE CODE &amp; NUMBER</td>
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<td>COURSE DESCRIPTION</td>
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<tr>
<td>ARTS AND HUMANITIES (AH)</td>
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<tr>
<td>CAL</td>
<td>Pan Pil 19 2,4</td>
<td>Sexualidad, Kasarian at Panitikan</td>
<td>Pag-aaral ng interaksyon ng panitikan at mga usapin sa sexualidad at kasarian</td>
<td>3</td>
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<tr>
<td>CAL</td>
<td>Pan Pil 40 2,4</td>
<td>Panitikan at Lipunang Filipino mula 1946 Hanggang sa Kasalukuyan</td>
<td>Ang mga nangingibabaw na tema, anyo at kalakaran ng Panitikan ng Pilipinas pagkaraan ng ikalawang Digmaang Pandaigdig.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Pan Pil 50 2,4</td>
<td>Panitikan Makabayan</td>
<td>Ang mga namumukod na katangian ng panitikan makabayan at ang mga impluwensiya dito.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Theatre 10</td>
<td>Onstage, Offstage</td>
<td>A window to the world of the theatre, its humanizing role in society &amp; its relationship to the other arts.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Theatre 11 2</td>
<td>Dula at Palabas</td>
<td>An introductory survey to Philippine Theatre from rituals to contemporary forms.</td>
<td>3</td>
</tr>
<tr>
<td>CAL</td>
<td>Theatre 12</td>
<td>Acting Workshop</td>
<td>An introduction to the art &amp; skill of acting for the theatre.</td>
<td>3</td>
</tr>
<tr>
<td>ARCH</td>
<td>L Arch 1 2,5</td>
<td>Designing Eden: Introduction to Philippine Landscape Architecture</td>
<td>Walking-through Philippine landscape architecture through sciences and arts.</td>
<td>3</td>
</tr>
<tr>
<td>CFA</td>
<td>FA 28 2</td>
<td>Arts in the Philippines</td>
<td>Arts &amp; art making the Filipino way.</td>
<td>3</td>
</tr>
<tr>
<td>CFA</td>
<td>FA 30</td>
<td>Art Pleasures</td>
<td>The fine art of enjoying art.</td>
<td>3</td>
</tr>
<tr>
<td>CMC</td>
<td>Film 10</td>
<td>Sineng Sine</td>
<td>Film as art &amp; social practice.</td>
<td>3</td>
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<tr>
<td>CMC</td>
<td>Film 12 2</td>
<td>Sine Pinoy</td>
<td>Philippine cinema as art form &amp; cultural product.</td>
<td>3</td>
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<tr>
<td>CMC</td>
<td>J 18</td>
<td>News in the New Century</td>
<td>Reading &amp; understanding the news towards developing a critical public voice.</td>
<td>3</td>
</tr>
<tr>
<td>CMC</td>
<td>BC 10</td>
<td>Radio &amp; Television: On-Air/Off-Air</td>
<td>Understanding the dynamics of broadcasting</td>
<td>3</td>
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<tr>
<td>MUSIC</td>
<td>MuD 1</td>
<td>Reading Dance</td>
<td>An approach to understanding dance as art &amp; as cultural phenomenon.</td>
<td>3</td>
</tr>
<tr>
<td>MUSIC</td>
<td>MuL 9 5a</td>
<td>Musics of the Philippines</td>
<td>An overview of indigenous musical traditions &amp; musical idioms associated with cultures of various peoples of the Philippines.</td>
<td>3</td>
</tr>
<tr>
<td>MUSIC</td>
<td>MuL 13</td>
<td>World Music Cultures</td>
<td>A study of music from representative regions of the world from the perspectives of music as a sonic object, as a social act &amp; as thought &amp; cognition.</td>
<td>3</td>
</tr>
<tr>
<td>CIS</td>
<td>SEA 30 2</td>
<td>Asian Emporiums: Networks of Culture &amp; Trade in Southeast Asia</td>
<td>An introduction to the world of monsoon Asia as formed by interaction among its peoples throughout the centuries.</td>
<td>3</td>
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<tr>
<td>MATH, SCIENCE, AND TECHNOLOGY (MST)</td>
<td></td>
<td></td>
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<tr>
<td>CHE</td>
<td>FN 1</td>
<td>Food Trip</td>
<td>Food and nutrition in daily living.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>BIO 1</td>
<td>Contemporary Topics in Biology</td>
<td>Recent developments in biology pertinent to concerns about the nature of life, health &amp; related social issues.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>Chem 1 6</td>
<td>Chemistry: Science that Matters</td>
<td>Basic chemistry concepts relevant to everyday life.</td>
<td>3</td>
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<tr>
<td>CS</td>
<td>Env Sci 1</td>
<td>Environment &amp; Society</td>
<td>Introduction to principles &amp; concepts in the study of the natural environment within a societal framework.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>Geol 1</td>
<td>Our Dynamic Earth</td>
<td>The study of how the earth works, its place in the universe, &amp; relationship between people &amp; the physical environment.</td>
<td>3</td>
</tr>
<tr>
<td>OFFERING UNIT</td>
<td>COURSE CODE &amp; NUMBER</td>
<td>COURSE TITLE</td>
<td>COURSE DESCRIPTION</td>
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<td>MATH, SCIENCE, AND TECHNOLOGY (MST)</td>
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<tr>
<td>CS</td>
<td>Math 1(^7)</td>
<td>General Mathematics</td>
<td>The development of mathematical literacy &amp; appreciation through a synoptic view of the different branches of mathematics with historical notes &amp; applications.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>Math 2(^{24})</td>
<td>Practical Mathematics</td>
<td>Basic mathematics skills &amp; applications in everyday life.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>MBB 1</td>
<td>Biotechnology &amp; You</td>
<td>Historical events, processes, products, issues &amp; concerns in modern biotechnology.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>MS 1</td>
<td>Oceans &amp; Us</td>
<td>An appreciation course on the functional balance between the health of the oceans &amp; the survival &amp; improvement of our way of life.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>Nat Sci 1(^6)</td>
<td>Foundations of Natural Science 1</td>
<td>Fundamental concepts, principles &amp; theories of physics &amp; chemistry.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>Nat Sci 2</td>
<td>Foundations of Natural Science 2</td>
<td>Fundamental concepts, principles, &amp; theories of earth &amp; life sciences.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>Physics 10(^6)</td>
<td>Physics &amp; Astronomy for Pedestrians</td>
<td>A &quot;walk-through&quot; course for people who want to enjoy physics &amp; astronomy.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>STS</td>
<td>Science, Technology &amp; Society</td>
<td>The analysis from historical &amp; futuristic perspectives of the nature &amp; role of science &amp; technology in society &amp; of the socio-cultural &amp; politico-economic factors affecting their development with emphasis on Philippine setting.</td>
<td>3</td>
</tr>
<tr>
<td>CS</td>
<td>MBB 1</td>
<td>Biotechnology &amp; You</td>
<td>Historical events, processes, products, issues &amp; concerns in modern biotechnology.</td>
<td>3</td>
</tr>
<tr>
<td>COE</td>
<td>EEE 10</td>
<td>Everyday EEE: Kuryente, Radyo atbp.</td>
<td>Electrical &amp; electronics engineering in everyday life.</td>
<td>3</td>
</tr>
<tr>
<td>COE</td>
<td>ES 10</td>
<td>Forces at Work</td>
<td>Principles of engineering mechanics &amp; their relevance to everyday life.</td>
<td>3</td>
</tr>
<tr>
<td>COE</td>
<td>GE 1</td>
<td>Earth Trek</td>
<td>A guided exploration into the tools &amp; techniques of earth observation &amp; measurement.</td>
<td>3</td>
</tr>
<tr>
<td>COE</td>
<td>CE 10(^{16})</td>
<td>DMAPS: Disaster Mitigation, Adaptation and Preparedness</td>
<td>Introduction to principles and practices of natural disaster risk management by mitigation, adaptation, and preparedness strategies through civil engineering and related disciplines aiming for resilience.</td>
<td>3</td>
</tr>
<tr>
<td>ARCH</td>
<td>L Arch 1(^{2,5})</td>
<td>Designing Eden: Introduction to Philippine Landscape Architecture</td>
<td>Walking-through Philippine landscape architecture through sciences and arts.</td>
<td>3</td>
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<tr>
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<td></td>
<td>SOCIAL SCIENCES AND PHILOSOPHY (SSP)</td>
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</tr>
<tr>
<td>CSSP</td>
<td>Anthro 10</td>
<td>Bodies, Senses &amp; Humanity</td>
<td>Interaction of biology &amp; culture in the shaping of humanity.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Geog 1</td>
<td>Places &amp; Landscapes in a Changing World</td>
<td>Overview of the diversity of interconnections of peoples &amp; places in a globalizing world as mediated by cultures, politics &amp; historical developments.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Kas 1(^6)</td>
<td>Kasaysayan ng Pilipinas</td>
<td>Ang pagsulong na politikal, pang-ekonomiya, panlipunan at pagkakaisipan ng Pilipinas.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Kas 2</td>
<td>Ang Asya at ang Daigdig</td>
<td>Ang pamanan pangkakaisipan ng Asya sa pagkaka-ugnan at ang kaugnayan nito sa kabuhatan ng panaigdig.</td>
<td>3</td>
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<tr>
<td>OFFERING UNIT</td>
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<tr>
<td>SOCIAL SCIENCES AND PHILOSOPHY (SSP)</td>
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<tr>
<td>CSSP</td>
<td>Lingg 1</td>
<td>Ikaw at Wika Mo</td>
<td>Mga pangunahing konsepto tungo sa pag-unawa, paggamit at pagpapahalaga sa wika bilang produkto ng talino ng tao sa kanyang pang-araw-araw na pakikipag-ugnayan, at higit sa lahat, sa konteksto ng silasayong pangwika sa Pilipinas.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Philo 1</td>
<td>Philosophical Analysis</td>
<td>Application of basic concepts, skills &amp; principles drawn from the Philosophy of Language, Symbolic Logic, Epistemology, Philosophy of Science &amp; Ethics.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Philo 10</td>
<td>Approaches to Philosophy</td>
<td>Overview of major philosophical traditions.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Philo 11</td>
<td>Logic</td>
<td>Techniques of formal deduction within the scope of sentential &amp; predicate logic.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Soc Sci 1</td>
<td>Foundations of Behavioral Sciences</td>
<td>A survey of basic concepts, principles, theories &amp; methods of the behavioral sciences (Sociology, Psychology, Anthropology, Political Science, Economics, including Linguistics Demography &amp; Geography) &amp; the dynamics of social change.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Soc Sci 2</td>
<td>Social, Economic &amp; Political Thought</td>
<td>A survey of social, economic &amp; political thought from the classical to contemporary times.</td>
<td>3</td>
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<tr>
<td>CSSP</td>
<td>Soc Sci 3</td>
<td>Exploring Gender &amp; Sexuality</td>
<td>A cross-cultural survey of gender &amp; sexuality, applying perspectives from the different social sciences.</td>
<td>3</td>
</tr>
<tr>
<td>CSSP</td>
<td>Socio 10</td>
<td>Being Filipino: A Sociological Exploration</td>
<td>A sociological examination of the persistent issues of nationhood, selfhood &amp; citizenship in Philippine society.</td>
<td>3</td>
</tr>
<tr>
<td>ASP</td>
<td>Archaeo 2</td>
<td>Archaeological Heritage: The Past is not a Foreign Land</td>
<td>A survey of archaeological research &amp; its role in the development of knowledge about the human collective past, the past of specific cultures, especially those of Southeast Asia, &amp; the nature &amp; role of heritage in the contemporary world.</td>
<td>3</td>
</tr>
<tr>
<td>ASP</td>
<td>Arkiyoloji 1</td>
<td>Ang Pilipinas: Arkiyoloji at Kasaysayan</td>
<td>Tatalakayin ang kasaysayan ng Pilipinas, nakasentro sa kaalaman mula sa arkiyoloji. Ipaalam din ang malawak na ugnayan ng sining sa kasaysayan ng rehiyon sa kasaysayan ng Pilipinas.</td>
<td>3</td>
</tr>
<tr>
<td>ECON</td>
<td>Econ 11</td>
<td>Markets &amp; the State</td>
<td>Essential economic concepts &amp; their use in analyzing real-world issues.</td>
<td>3</td>
</tr>
<tr>
<td>ECON</td>
<td>Econ 31</td>
<td>A Journey Through Time: Economic Ideas &amp; Civilization</td>
<td>A survey of the influence of economic ideas on historical events of the last century &amp; a half.</td>
<td>3</td>
</tr>
<tr>
<td>ARCH</td>
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<td>3</td>
</tr>
</tbody>
</table>
NOTES:
1. Comm 1 & English 1 are equivalent courses and therefore only one (1) course will be credited towards the GE requirement.
1a. Comm 1 & English 10 are equivalent courses and therefore only one (1) course will be credited towards the GE requirement.
2. May be taken to satisfy Philippine Studies requirement.
3. Preferably Junior Standing
3a. Preferably Junior or Senior Standing
4. Preferably Sophomore Standing
5. Can be taken to fulfill GE requirement either AH, MST, or SSP; Can only be credited once
5a. Can be taken to fulfill GE requirement either AH or SSP; Can only be credited once
5b. Can be taken to fulfill GE requirement either MST or SSP; Can only be credited once
6. This course cannot be taken by students in the College of Engineering except those under the BS Computer Science Program.
7. Math 1 cannot be taken by BS Math students
7a. Math 2 cannot be taken by students of degree programs which require at least Math 11

RETENTION RULES
Students who wish to study and pursue careers in electrical and electronics engineering and any of its allied fields need to acquire a strong background in the fundamentals of mathematics, physics, and other engineering sciences, in addition to courses in their chosen field. To ensure that student aptitudes and interests match the rigors and demands of the program, and that graduates consistently meet the high quality standards expected of products of our programs, the Institute enforces academic retention rules that EEE undergraduate students must satisfy, in addition to existing College and University academic rules and regulations, in order to remain in good academic standing.

A student will be permanently dismissed from any EEE undergraduate program if he or she:

- Incurs a grade other than a passing grade twice in any of these mathematics courses: (Math 17, 53, 54, 55);
- Accumulates three or more grades other than passing grades in any combination of these mathematics courses (Math 17, 53, 54, 55);
- Incurs a grade other than a passing grade twice in any of these basic EEE courses (EEE 23, 31, 33, 35, 41);
- Accumulates three or more grades other than passing grades in any combination of these basic EEE courses (EEE 23, 31, 33, 35, 41)

For purposes of this retention rule, a "grade other than a passing grade" includes the following: a 5.0, an unremoved 4.0, an unremoved INC, or a DRP recorded at the end of the semester or semesters under evaluation.