GREETINGS FROM DEPT CHAIRMAN

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GREETINGS FROM DEPT CHAIRMAN

Welcome to the Electronic Engineering (EE) Department at Hanyang University. The EE department was derived from the Electric Power Engineering Department which was founded almost 76 years ago. The department has gone through many transformations since then. It has been 6 years since we embarked as the first in Korea on a new department, EE with the concept of Convergence in Electronics. This EE Department is designed to provide a curriculum for convergence between areas such as electronics, information, and communications. In addition, the EE Department promotes academic activities in IT convergence with vehicles, biology, and media, to name only a few.

The EE Department is the largest in the engineering school with 40 full time faculty members and about 1000 undergraduate and graduate students. Our department has been selected as one of the 7 Diamond Departments of Hanyang University and is supported each year with an extra 1.5 Million US$ from the university for scholarships and other welfare programs. Almost all freshmen and more than 50% of our students in the other grades receive full scholarships either from the University or from the industry. Naturally, we admit the top 1% of all high school graduates in Korea. After 4 years of education, they are the graduates most highly favored by the best engineering companies in Korea including Samsung Electronics, LG Electronics, and Hyundai Motor Company. Also many graduates pass government exams to become government officers and patent lawyers. Our department graduates almost always appear among the top 3 seats in these examinations.

Our Department has been selected as one of the seven EE departments for the “Brain Korea (BK) 21 program” over the 6 years. In 2013, we were once again selected as one of the six EE departments for the “Brain Korea 21+ program”. Through this program, every year we will be receiving almost 2.5 Million US$ from the government to support our graduate students. In the first seven years of the BK 21 program, we were ranked number 1 five times among the participating universities (departments) at the annual evaluations. In 2013, Hanyang University was evaluated as the best university in Korea in terms of technology transfer and patents by the Electronic Times News of Korea. The total amount of research funding brought in from the industry and the government in 2013 amounted to almost 15 Million US$.

Please browse our website, learn more about us, and contact us with any questions. If you are joining us as a student, we look forward to your contributions to our department and to the field of EE in general. We hope to be part of your success.

Wan-Jun Park,
Professor and Chairman, Department of Electronic Engineering
The history of Department of Electronic Engineering – Convergence in Electronics itself is a history of electronic engineering in Korea. Owing to the legacy of outstanding students, excellent faculty, and field centered education, the Department of Electronic Engineering leads the development and innovation of electronic, information, and communications technology in Korea. A place where the engines of young talent are trying to realize the technology of tomorrow by imagining new ways to use IT technology. A place which gives off the spirit of innovation and challenges the impossible dreams of tomorrow. This is the Department of Electronic Engineering – Convergence in Electronics.
The seeds of Electronic and Electrical Engineering in Korea have spread and grown.

The seeds of electronic and electrical engineering in Korea have spread and grown since the department was founded in 1964.

The Department of Electronic Engineering has been at the center of Korea’s electronic, electrical, and communication engineering. Its students and graduates have provided a driving force of technology and industry.

History

**February 1964**
Founding of the Department of Electronic Engineering in the College of Engineering

**March 1997**
Integration of the Department of Electrical Engineering with the Department of Electronic, Telecommunication, and Radio Science Engineering into The School of Electronic and Electrical Engineering

**March 2010**
Founding of the Department of Electronic Engineering – Convergence in Electronics in the College of Engineering, with a renewed focus on merging of electronics, information, communication, and other technologies.
Create new values to the future through challenge and innovation
Creating high added value through challenge and innovation towards the future

The mission is to create added value through a synergy of advanced Communications, Semiconductor, Display, and Computer Technologies. We apply this philosophy to smartphones, futuristic automobiles, intelligent robots, and to related fields such as bioscience and aerospace. The Electronic Engineering–Convergence in Electronics program is committed to solving important issues pertaining to a wide range of branches in electronics including Communication Technologies, Semiconductor Embedded Microelectronics, Optical Display Technology, and VLSI design. Our department has been selected as one of seven Diamond Departments at Hanyang University, and is therefore given special support from the university. Graduates of our program are counted among the top tier of their class in Korea, and their training is supported by collaboration programs organized with major Korean corporations.
We foster Digital-i-engineers with creative research capabilities.

We aim to produce Digital-i-engineers who will not only have a sound theoretical foundation, but who will also have plenty of hands-on experience designing and developing circuits, systems, and products. Our program endeavors to guide these individuals to identify, understand, develop, and transfer critical technologies, and to thereby improve their capabilities as they enter a globally competitive marketplace. The program is thus designed to meet the emerging needs of modern engineers in industry, research, and educational establishments.

- who can analyze and solve engineering problems, equipped with a strong foundation of basic knowledge and the tools of math and engineering science.
- who will have the creative ability to plan and perform experiments and to develop systems, elements and processes.
- who can apply theoretical knowledge combined with practical hands-on training to the convergence of electronic engineering, and who can perform a vital role as a team member in an organization.
- who can continue their lifelong education.
- who has developed a culture of understanding regarding world economy, the environment, and social phenomenon, and who can fulfill the occupational and ethical responsibility to cooperate with and to serve the society.

Department of Electronic Engineering – Convergence in Electronics

- Our Educational Strategy
  - Design and introduce new courses in various fields to meet present-day challenges, and encourage the participation of the industries in those fields in order to benefit from their advanced knowledge and skills.
  - Implement a set of creative and comprehensive courses that reflect the technologies which are in demand in industry.
  - Manage a comprehensive undergraduate/graduate curriculum through a combination of related courses in order to develop an expertise in the convergence of applications.
  - Encourage field training through an internship program.
  - Encourage graduates to continue their higher education through research programs.

- Our Research Strategy
  - Inspire joint research within the various Information Technology areas.
  - Inspire joint research among other special areas such as Nano, Bio, and Green Technologies.
  - Apply the results emerging from this convergence of research fields.

- Our Strategy to Promote the Convergence of Technologies
  - Introduce our converged technologies into the next generation of mobile phones, wireless communication devices, semiconductors, embedded systems, and IT systems used in automobiles.
  - Develop the technologies required by industry today into those which will be needed in the field tomorrow.
Curriculum that meets market demand

We are continuously evaluating and improving our curriculum to reflect various opinions from industry, academia, and other sources.

### Green / Fusion IT Digital Convergence

- Intelligent Network Digital Broadcasting Telematics
- Broadcasting Communication Convergence System
- Mobile Convergence Terminal System
- Next generation mobile embedded System / Intelligent Automobile / Robot
- Green IT
- Bio-Electronics
- Automobile IT
- Intelligent Display
- Multi-core SoC

### Main curriculum

<table>
<thead>
<tr>
<th>Graduate school course</th>
<th>An introduction to Green IT</th>
<th>Introduction to Vehicular IT Engineering</th>
<th>Introduction of Bioelectronics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Convergence Courses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introduction of Electronic Design</td>
<td>Capstone Design</td>
<td>Mobile Systems Design</td>
<td>Integrated Multimedia Systems</td>
</tr>
<tr>
<td>Semiconductor Fabrication</td>
<td>Design and Process of Display</td>
<td>Wireless Communications</td>
<td>Coding Theory</td>
</tr>
<tr>
<td><strong>Advanced Courses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semiconductor Devices</td>
<td>Display Electronics</td>
<td>Microwave Circuit Design</td>
<td>Random Process</td>
</tr>
<tr>
<td>Integrated Circuit Devices</td>
<td>Introduction to Information Processing</td>
<td>Analog Circuit Design</td>
<td>Digital Communication</td>
</tr>
<tr>
<td>Antenna Engineering</td>
<td>Modern Physics</td>
<td>Optoelectronics</td>
<td>Communication System</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Optical Communications</td>
</tr>
<tr>
<td><strong>Introductory Courses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Physics of Solid State Electronics</td>
<td>Microelectronic Circuits 1, 2</td>
<td>Digital Signal Processing 1, 2</td>
<td>Computer Architecture</td>
</tr>
<tr>
<td>Engineering Electromagnetics, Field &amp; Wave Electromagnetics</td>
<td>Circuit Theory 1, 2</td>
<td>Numerical Analysis</td>
<td>Signals and Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Digital Logic Design</td>
</tr>
<tr>
<td><strong>Distributed Prerequisite Courses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering Mathematics 1, 2</td>
<td>Probability &amp; Statistics</td>
<td>Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>General Physics for Electronics Engineers 1, 2</td>
<td>General Chemistry</td>
<td>Computer Programming</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calculus 1, 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

※ Graduate school course in detailed major field (training core experts) – cross-course of undergraduate curriculum
Career
Scholarship and Postgraduate Career Path

Extensive scholarship and merit programs

In addition to scholarship programs supported by the university, students may apply to participate in a pre-employment program available from various sponsor corporations.

**Scholarship programs for international students**

<table>
<thead>
<tr>
<th>Name of Scholarship</th>
<th>Eligibility</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanyang Scholarship for Engineering and Science Students</td>
<td>International students who gain admission to the graduate school of engineering and science and are recommended by a professor at Hanyang University</td>
<td>50% reduction in tuition and admission fees</td>
</tr>
<tr>
<td>Hanyang International Scholarship Program (HISP)</td>
<td>HISP grantees are selected based on scholastic achievement at their previously attended institution among applicants who are eligible to apply for the HISP.</td>
<td>100%, 70% or 50% reduction in tuition</td>
</tr>
<tr>
<td>Hanyang International Excellence Awards (HIEA)</td>
<td>International students who have achieved notable academic progress at Hanyang University</td>
<td>70%, 50% or 30% tuition reduction according to their evaluation results</td>
</tr>
<tr>
<td>Hanyang Scholarship for Excellence in Language Proficiency</td>
<td>Applicants who have passed the TOPIK level 5 or 6, or achieved a TOEFL IBT score of 90 or higher</td>
<td>30% reduction in tuition for the first semester</td>
</tr>
</tbody>
</table>

**Advance employment and scholarship sponsorships**

A pre-employment program is available from various sponsor corporations, including, LG Display, and SK Hynix. Those students selected receive a full scholarship from the sponsor.

**Full scholarships for graduate study**

Full scholarships are available to students admitted into a combined Ph.D. program (Masters + Ph.D.). (Graduate School rules apply)
Post graduate career paths for students

Graduates of the Electronics Engineering department at Hanyang University may pursue various career paths. The options for their future are wide open. Many major corporations consider our graduates to be among their most valued resources. Graduates of the Electronic Engineering program at Hanyang University have been recognized as leaders in their fields at all levels of positions in Korean Industry, from CEOs of major corporations to founders of start-up companies. Many have become specialists in a variety of fields including marketing and corporate planning in information technology, while others have become heads of R&D, patent lawyers, and government technocrats.

<table>
<thead>
<tr>
<th>Entrance to graduate school</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>41%</td>
<td>59%</td>
</tr>
</tbody>
</table>

Employment rate of graduates from major universities during the past 3 years

Source: Allime, University information announcement center

<table>
<thead>
<tr>
<th>University</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanyang Univ.</td>
<td>80%</td>
</tr>
<tr>
<td>KAIST</td>
<td>70%</td>
</tr>
<tr>
<td>Seoul National Univ.</td>
<td>60%</td>
</tr>
<tr>
<td>Pohang Univ. of Science and Technology</td>
<td>50%</td>
</tr>
<tr>
<td>Korea Univ.</td>
<td>40%</td>
</tr>
<tr>
<td>Yonsei Univ.</td>
<td>30%</td>
</tr>
</tbody>
</table>

Employment statistics of Hanyang graduates at various companies

Source: University Information-me

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Others</td>
<td>26.7%</td>
</tr>
<tr>
<td>LG</td>
<td>26.7%</td>
</tr>
<tr>
<td>Hyundai</td>
<td>17.3%</td>
</tr>
<tr>
<td>Samsung</td>
<td>13.3%</td>
</tr>
<tr>
<td>Public administrative institution</td>
<td>10.7%</td>
</tr>
<tr>
<td>License corporation</td>
<td>5.3%</td>
</tr>
</tbody>
</table>

Ranking among universities by the number of corporate CEOs in the Top 100 companies (The New Management, 2015.4.21)

1st

Ranking among universities by the number of corporate CEOs in venture companies (JoongAng Daily, 2015.10.22)

2nd

University rankings (Joongang Ilbo, 2016.10)
Top faculty cultivating top students

The research achievements of our professors, measured in terms of the number of papers published in International Technical Journals by each professor; place Hanyang University as the top university in the nation for 5 years. The evaluation report produced by the BK21 project, which has been sponsored by the Korean Government Research Fund, also rates Hanyang University as the top in the nation.

BK21 project evaluation ranking in the information and communications technology area

The evaluation ranking of the BK21 and BK21 PLUS projects has not been released, since 2011.
- 16.8 : 1 ratio of undergraduate students per faculty

- Average rank is 1st over the past 5 years according to the cash value of the technology transferred to industry per faculty

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Average rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>rank</td>
<td>3rd</td>
<td>1st</td>
<td>2nd</td>
<td>1st</td>
<td>1st</td>
<td>1st</td>
</tr>
</tbody>
</table>

※ In the amount of corporate transfer of developed technology per faculty in electronics, which reflect practical value of technologies developed in the university, average of 1st (5 years average)

- Average rank is 1st over the past 4 years according to the number of publications per faculty member in SCI journals

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Average rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>rank</td>
<td>2nd</td>
<td>1st</td>
<td>1st</td>
<td>2nd</td>
<td>1st</td>
</tr>
</tbody>
</table>

※ 1st in 4 years average of SCI journals published per faculty in electronics

- Average rank is 2nd according to government research funding per faculty

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Average rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>rank</td>
<td>1st</td>
<td>1st</td>
<td>2nd</td>
<td>2nd</td>
<td>2nd</td>
<td>2nd</td>
</tr>
</tbody>
</table>

※ Average of 2nd in benefit of government research fund per faculty in electronics / average of 1st among private universities

- Average rank is 1st over the past 5 years according to the number of patent registrations per faculty

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Average rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>rank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st</td>
</tr>
</tbody>
</table>

※ Maintaining national average 1st in number of domestic/foreign patents registered per faculty in electronics

- Average rank is 2nd according to corporate research funding per faculty

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Average rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>rank</td>
<td>3rd</td>
<td>4th</td>
<td>1st</td>
<td>1st</td>
<td>3rd</td>
<td>2nd</td>
</tr>
</tbody>
</table>

※ Average of 2nd in benefit of corporate research fund per faculty in electronics / average of 1st, excluding universities operated by large companies
Professors of Department of Electronic Engineering
Joon-Hyuk Chang

Professor

Speech, Acoustics, Audio Signal Processing Laboratory

1. Speech Signal Processing
   • Statistical modeling of speech signal
   • Voice activity detection
   • Preprocessing of standard codec for quality of speech and audio signal
   • Single/dual channel noise suppression
   • Robust speech recognition

2. Acoustics Signal Processing
   • Computational auditory scene analysis
   • Acoustic echo cancellation/suppression
   • Acoustic sound classification
   • Bioacoustics
   • Perceptual relevant measures of speech and audio quality/intelligibility

3. Audio Signal Processing
   • MPEG AAC codec, enhanced AAC codec
   • MP3 codec
   • Speech/music classification
   • Music search

4. Digital Signal Processing
   • Multimodal signal processing
   • Biomedical signal detection using multimodality
   • Epileptic seizure detection and classification using EEG signal
   • Blood pressure measurement and estimation

[Research]
Speech, Acoustics, Audio Signal Processing

[Subjects]
Undergraduate: Probability and Random Processes, Signals and Systems
Graduate: Discrete-Time Digital Processing etc.

[Education]
Ph.D., Seoul National University, Korea

[Career]
2011 ~ Present Hanyang University, Associate Prof.
2010 ~ Present ASK, Journal editorial writer
2009 ~ Present KICS, Signal processing research society vice-chairman
2009 ~ Present Korea Society of Speech Sciences, cooperation director
2008 ~ 2011 Inha University, BK21 core business team leader
2005 ~ 2011 Inha University, Assistant Prof.
2005 KIST, Research Scientist
2000 ~ 2004 Netdus Corp., Chief Engineer
2004 ~ 2005 Postdoc Fellow, University of California, Santa Barbara

[Research]
Speech, Acoustics, Audio Signal Processing

Tel. 02-2220-0355
E-mail. jchang@hanyang.ac.kr
http://asap.hanyang.ac.kr
Sung Ho Cho  Professor

Embedded Wireless Communications Laboratory

1. Applied Signal Processing
   • Context Aware Computing
   • Radar Computing
   • Machine Learning for Signal Processing
   • Embedded System HW/SW Design

2. UWB Radar Computing
   • 2D/3D Indoor Positioning & Tracking for Multiple Targets
   • Presence & Intrusion Detection
   • People Counting & Crowdedness Measurement
   • Moving & Gazing Direction Recognition
   • Gesture Recognition
   • See-Through-Wall Detection
   • Healthcare (Non-contact Breathing/Heart Rate, Non-contact Sleep Monitoring, Non-contact Cardiac Monitoring, Non-contact Fetal Monitoring)
   • Radar Imaging [Phased Array]

3. Smart Sensing for Automotive
   • CW/FMCW/UWB Radar Applications for Automotive
   • Road Obstacle Detection
   • Collision Warning System
   • Parking Assistance System
   • Blind Spot Monitoring
   • Gesture Recognition

[Research]

[Subjects]
Undergraduate: Signals and Systems, Digital Signal Processing I & II, Probability
Graduate: Advanced Signal Processing, Probability and Random Processes

[Education]
Ph.D., University of Utah, USA

[Career]
2015.8 ~ Present  Dean, College of Engineering, Division II
2013.8 ~ 2015.7  Vice Dean, College of Engineering
2008.10 ~ 2014.2  Director, Research Center for RFID/Communications Technologies
2008.1 ~ Present  High-level Visiting Scientist Fellowship [111 客座科學家], Beijing University of Posts and Telecommunications (BUPT), China
1992.9 ~ Present  Professor at Hanyang University
1989.8 ~ 1992.8  Senior Researcher at ETRI, Korea
System IC Laboratory

1. Display Electronics
   - Low-area driving circuits for high-image quality flat panel displays
   - Low-power, high-speed driving circuits for 3-D displays
   - Driving methods and circuits for AMOLEDs
   - TFT circuit design for flexible displays and electronics

2. Power Management Circuits
   - High-efficiency DC-DC converter
   - Low-noise, high-efficiency PFM Buck DC-DC converter
   - Capacitor-less Low Drop-out regulator (LDO)

3. Sensor Interface Circuits
   - Read-out circuit design for CMOS image sensors
   - Read-out circuit design for In-cell type touch screen panel

4. Cryptographic Circuits for Security Applications
   - Design methodology for protecting security ICs from external physical attacks
   - ID generation methods for chips based on the semiconductor process variations

5. Bio-Medical Circuit and System
   - Read-out circuits for bio-mimetic tactile sensor system
   - Neural stimulator for human brain perception

[Research]
Jaehoon Choi  
Professor

Antennas and RF Devices Laboratory

1. Research on Military RADAR Antenna  
- RADAR antennas and active phase array antennas for Unmanned Aerial Vehicle (UAV) and guided missile

2. Design of RADAR antennas and Waveguides for off-shore plant  
- Design of RADAR and Ka band waveguide transitions for measurement of a residual oil at a LNG tank

3. Design of small antennas  
- Glasses antennas with low SAR values

4. Research on safety evaluation for hybrid electric vehicle  
- Effects of exposure to electromagnetic in a hybrid electric vehicle

5. Study of electromagnetic analysis algorithm  
- Algorithm for partial discharge localization in a transformer

[Subjects]
Undergraduate: Field & Wave Electromagnetics, Microwave Circuit Design, Antenna Engineering  
Graduate: EMI, Antennas

[Education]
Ph.D., Ohio State University, USA

[Career]
2014.1 ~ Present  
Honorary President, Korean Institute of Electromagnetic Engineering and Science

2010 ~ Present  
Chair, AP-S Seoul Chapter, IEEE

2004.9 ~ 2016.3  
Outside Director, EMW Co., Ltd., Korea

2004.1 ~ Present  
Professor, Dept. of Electronic Engineering, Hanyang University

2013.1 ~ 2013.12  
President, Korean Institute of Electromagnetic Engineering and Science

2011.8 ~ 2013.7  
Dean, College of Engineering, Hanyang University

2010.3 ~ 2011.8  
Dean, College of Engineering II, Hanyang University

2010.1 ~ 2012.12  
Vice President, Korean Institute of Electromagnetic Engineering and Science

2006.9 ~ 2011.8  
Head of Department, Dept. of Electronic Engineering, Hanyang University

2006.3 ~ 2011.8  
Director of BK21 IT program

1995.3 ~ 2003.12  
Associate Professor, Dept. of Electronic Engineering, Hanyang University

1991.4 ~ 1995.2  
Head of Research Team, Satellite Business Group, Korea Telecom, Korea

1989.9 ~ 1991.3  
Research Professor, Arizona State University, USA

Design of array antennas for UAV  
Electromagnetic exposure of hybrid electric vehicle  
Low SAR antennas for VR glasses  
SAR analysis

Tel.  
02-2220-0376  
E-mail.  
choijh@hanyang.ac.kr  
http://antrf.hanyang.ac.kr
Seung-Won Choi  Professor

Communication Signal Processing Laboratory

1. Cloud Communication Center (CCC) System
   - Cloud Communication Network (CCN): Base station system includes RF units only
   - CCC system architecture: consists of BB processing unit, RF transceiver, and interface between BB and RF

2. Standardization of SDR Mobile Device
   - Standard Architecture and Standard Interfaces
     - Standardization at WG2 of TC-RRS of ETSI (European Telecommunications Standard Institute)
     - Reconfiguration of Mobile Device with Software modem downloaded from Radio AppStore
   - Wideband RF transceiver for SDR Mobile Device

3. Multiple Input Multiple Output (MIMO)
   - Multi-User MIMO System for enhancing channel capacity
   - Precoding and User Selection for Multi-User MIMO

4. Smart Antenna – Beamforming with 3D pencil beam (Conjugate Gradient, Lagrange, etc)

[Research]
SDR (Software Defined Radio), MU-MIMO (Multi-User Multiple Input Multiple Output), Cloud Communication Network (CCN), WiBro SA RAS, Smart Antenna API Standardization, URA (Unified Radio Application)

[Subjects]
Undergraduate: Digital Communication, Radio Communication engineering, Signals And Systems
Graduate: Advanced Information and Communication, Mobile Communication engineering, Electromagnetic Communication Engineering, RRS (Reconfigurable Radio Systems)

[Education]
Ph.D., Syracuse University, USA

[Career]
2012 ~ Present  HY-MC Research center, Director
2010 ~ Present  The Institute of Electronics Engineers of Korea, executive director
2009 ~ Present  CR/SDR Forum of Korea, Board Member
2009 ~ Present  ERA Wireless, technical adviser
2004 ~ Present  SDR Forum, Vice President
2002 ~ 2010  HY-SDR Research center, Director
1992 ~ Present  Hanyang University, Professor
1990 ~ 1992  National Institute of Information and communications Technology, Senior Researcher
1989 ~ 1992  ETRI, Assistant Professor
1988 ~ 1989  Syracuse University, Assistant Professor
1982 ~ 1984  LG Electronics Co Ltd, Research Engineer
Embedded System-on-Chip Laboratory

1. System-level Power Management
   • Power management for multi-core CPUs
   • Power management for mobile GPUs
   • Power management framework for mobile platforms
   • Power management interface development for Linux and Android environment
   • Programming model-driven power management

2. Parallelization using GPUs and Multi-Core CPUs
   • Parallelization of entropy decoding using OpenMP based implementation of multi-threaded syntax element partitioning
   • Parallelization of the entire H.264/AVC decoding process utilizing both thread scheduling and simultaneous multi-threading
   • Parallel implementation of LDPC decoding using both CUDA and OpenMP on heterogeneous multicore systems

3. SoC Platform-based Verification Method
   • Various IP verification experiences using MentorGraphics’ Veloce emulation system
   - Cortex-M0 Platform IP - H.264/AVC Decoder IP
   - Control Area Network IP - JPEG - FFT 256
   • IP verification method using Xilinx Zynq 7000 series

4. Digital CMOS IP Design for Communication
   • Low power CMOS digital interface circuits
   • Hardware IPs for decoding error correcting codes
   • High performance and low power on-chip interconnection design
   • Dynamically reconfigurable arithmetic units for DSPs

[Research]
Embedded Software for Multi-core Systems, Low Power Design Methodology, Reliable Communication and DSP System, Parallel Programming Framework

[Subjects]
Graduate: SoC Architecture, SoC Design Methodology, Low Power System Design

[Education]
Ph.D., University of Illinois, Urbana-Champaign, USA

[Career]
2004.3 ~ Present  Professor at Hanyang University
2001.9 ~ 2004.2  Assistant Professor at Hongik University
2000.7 ~ 2001.8  Staff Engineering at Intel Corp.CA, USA
1998.7 ~ 2000.6  Senior R&D Engineer at Synopsys, Inc.CA, USA
1997.9 ~ 1998.5  Lecturer at Univ.of Illinois at Urbana-Champaign

Ki-Seok Chung
Professor
Department of Electronic Engineering
Jae-Kyeong Jeong  Professor

Semiconductor, Nano Device Laboratory

1. Next Generation TFT Backplane Electronics for Advanced Display
   - Design of IGZO-based TFTs for high-pixel-density TFT-LCD and AMOLED display
   - Development of high field-effect mobility transistor
   - Bias-thermal-stress reliability of various TFTs

2. IoT Sensor
   - High efficient photo-sensor and bio-sensor based on III-V and II-VI class oxide, sulfide and nitride
   - Design and device development of IoT sensors with high selectivity and sensitivity

3. Power Devices
   - SiC and GaN-based semiconductor and related devices for the high power, high frequency and high temperature application

4. Next Generation Memory Devices
   - Development of stackable encoder and decoder IC for three dimension ReRAM memory devices

5. Flexible and Rollable Electronic Devices
   - Design and fabrication of new concept transistors with the transparency to visible light and flexibility

[Research]
IGZO-based Semiconductor and TFT, Power Devices, IoT Sensors, Transparent/Flexible Electronics

[Subjects]
Undergraduate: Modern Physics, Solid State Physics, Display Engineering
Graduate: Advanced Display Engineering, IoT Sensor Engineering

[Education]
Ph. D., Seoul National University

[Career]
2014    President Award from KDIA
2013    NAEK and Ministry of Trade and Industry, Future 100 Technologies and Contributor
2012    Merck Young Scientist Award
2015 ~ Present   Professor, Department of Electronic Engineering, Hanyang University
2009 ~ 2015   Assistant/Associate Professor, MSE, Inha University
2008 ~ 2009   Senior Engineer, Samsung Display
2004 ~ 2008   Senior Engineer, Central R&D Center, Samsung SDI
2003 ~ 2004   Postdoc., Univ. of Illinois at Urbana-Champaign
2002 ~ 2003   Postdoc., Inter-University Semiconductor Research Center, Seoul Nat’l Univ.
Je-Chang Jeong

Image Communication and Signal Processing Laboratory

1. Next Generation Video Codec
   - Optimization of prediction candidates in intra prediction
   - Optimization and low complexity of inter prediction algorithm
   - Studying for deblocking filter in high efficiency

2. Development of the Video Compression Technology and Server in Digital Cinema
   - Analysis of requirements in digital cinema and study for compression technology
   - Analysis of 1, 2, 3, 4k resolution video subjective quality
   - Development of streaming service and model using H.264/AVC’s SVC (Scalable Video Coding)

3. Multi View Video Coding
   - Proposal for a new direct mode in multi view video coding
   - Development of edge preserving algorithm and asymmetric encoding considering human 3D recognition system
   - Studying optimized human factor according to a video quality difference

4. Multimedia Codec Parallelization and Final processing IP Design
   - Analysis of main functions’ complexity in video codec
   - Optimization of operations using SIMD
   - Development of the parallelization of block unit using 2D-Wave

[Research]
Video Coding, Image Processing, Multimedia System Technologies

[Subjects]
Undergraduate: Digital Signal Processing, Image Processing, Multimedia System etc.
Graduate: Multimedia Communication, Video Coding

[Education]
Ph.D., University of Michigan, USA

[Career]
2012 ~ Present  Member, The National Academy of Engineering of Korea
2012 ~ Present  President, The Korean Society of Broadcast Engineers
2011        “Green Stripes of Service Merit”, Korea
1998 ~ 2000 Consultant, Handan BroadInfoCom
1998        “Research Scientist of the Month”, Ministry of Science and Technology, KOREA.
1991 ~ 1995 Senior Researcher, Samsung Electronics Co., Ltd
1990 ~ 1991 Post Doctoral Research Fellow, Univ. of Michigan
1986 ~ 1990 Teaching and Research Assistant, University of Michigan
1982 ~ 1986 Research Fellow, Korean Broadcasting System
Optical Communication & Digital System Design Laboratory

1. Nano Optical Fiber and Fiber Bragg Grating
   1. Photonic Crystal Fiber (PCF)
      - Photonic bandgap fiber
      - Mode guided photonic bandgap fiber
      - Low dispersion photonic bandgap fiber
      - Polarization maintaining photonic crystal fiber
      - Highly birefringent photonic crystal fiber
   2. Fiber Bragg Grating (FBG)
      - Fiber-optic FBG sensor

2. Optical Sensor
   • Distributed Optical fiber sensor
      - ing Brillouin scattering
      - using Sagnac interferometer (pressure, curvature, temperature, torsion, strain)

3. Fiber Laser
   • High power optical fiber laser
      - Using YDF

[Subjects]

Undergraduate : Circuit Theory I&II
Graduate : Optical Network, Fiber Optic Communications, Optical Communication System, Design of Communication System

[Education]

Ph.D., Northwestern University, USA

[Career]

1994 ~ Present  Department of Electronic Engineering
                Professor of Hanyang University
1980 ~ 1993  Electronics and Telecommunications Research Institute

[Research]

Nano Optical Fiber, Fiber Bragg Grating, Optical Sensor, High power optical fiber laser, Parallel interface design for optical transmission and PON, Optical Network and Home Network System design
Ubiquitous Networking Laboratory

1. VANET, MANET and V2X Communication
   - VANET (Vehicular ad-hoc network) and MANET (Mobile ad-hoc network) Technology and Systems
   - MAC Protocols
   - Networking Protocols
   - Security in Communications
   - V2X (V2V, V2I, V2N) Communications
   - V2X Network Simulator (Qualnet, OPNET, etc)

2. Vehicle Embedded Platform for Vehicle-IT Integration
   - Embedded Systems based on Embedded Linux, OSEK
   - In-Vehicle Networking (CAN, MOST, Flexray, IDB1394, etc)
   - Integrated Gateway System for Vehicular Network
   - Open Platform Technology (AUTOSAR, etc)

3. Future Internet QoS and Security
   - Future Internet
   - QoS Control for MoIP (Multimedia over IP) Service
   - Network Security

4. Modeling and Analysis of Military Network
   - Performance Analysis for Network Centric Warfare (Modeling & Simulation with Qualnet, OPNET)
   - Analysis of End-to-End Behavior

[Research]

Computer Networks, Vehicle-IT, Mobile and Wireless Networks

[Subjects]
Undergraduate: Data Communications, Computer Networks, Wireless Networks, Probability and Statistics
Graduate: Computer Networks

[Education]
Ph.D., ENST Paris, France

[Career]
2012 ~ Present  Chairman, Digital Signage Standard Forum
2010 ~ Present  Vice Chairman, Korea Institute of Information Security and Cryptology
1997 ~ Present  Professor, Hanyang Univ.
1993          Research Scientist, ENST Paris
1984 ~ 1997  Senior Researcher, R&D Center, KT
Kyung-Young Jung  Professor

[Subjects]  
Undergraduate: Engineering Electromagnetics, Field & Wave Electromagnetics  
Graduate: Advanced Electromagnetics, Electromagnetic Field Theory, Computational Electromagnetics, EMI, Antennas

[Education]  
Ph.D., Ohio State University, USA

[Occupation]  
2013 ~ Present  Associate Editor, IEICE Trans. Communications  
2013 ~ Present  Member of Board Directors, The Korean Institute of Electromagnetic Engineering and Science (KIEES)  
2012 ~ Present  Editorial Member, Journal of KIEES, Journal of EES  
2011 ~ Present  Associate Professor, Hanyang University  
2009 ~ 2011  Full-Time Lecturer, Ajou University  
2008 ~ 2009  Postdoc. Researcher, Ohio State University  
2001 ~ 2004  Researcher, Pantech & Curitel  
1998 ~ 2001  Researcher, Hyundai Electronics (Hynix)

[Research]  
Computational Electromagnetics, Plasmonic Solar Cells, Nano Electromagnetics, Bio Electromagnetics, High-Power Electromagnetics, EMC.
Embedded Security System Laboratory

1. Security SoC Design
   • Crypto system design
   • Hardware implementation of cryptographic system
   • FPGA and ASIC simulation

2. Physical Unclonable Function
   • Random value circuit design produced by the same circuit and process
   • Circuit design taking permanent random value after manufacturing

3. Mobile Payment
   • New USIM-based mobile payment system
   • Prototype and standard about payment terminal, protocol and payment process.

4. DPA Attack Countermeasure
   • Research of countermeasures against DPA attacks
   • Constant and random power consumption circuit design during operations

5. GPGPU Parallel Processing
   • Parallel processing implementation of symmetric key cryptograph
   • Parallel processing implementation of matching algorithm

[Research]
Security SoC Design, Physical Unclonable Function, Mobile Payment, DPA Attack Countermeasure, GPGPU parallel process
Microwave Engineering Laboratory

1. Antenna Design
- GradiANT (Ground Radiation Antenna) for Mobile Devices
- Feed Structure for Wideband Antenna using PIE (Planar Inverted-E), Double PIE Antenna
- Wideband Antenna Design using Electric and Magnetic Current Feeding Method
- Research of Resonance Mode Control Technique for Mobile Devices
- Research of MIMO (Multiple-Input Multiple-Output) Antenna Decoupling Technique
- Research of RFID (Radio Frequency Identification) / NFC (Near Field Communication) Reader and Tag Antenna

2. EMI/EMC
- Research of TRP (Total Radiated Power) / TIS (Total Isotropic Sensitivity) in Mobile Devices
- EMC/EMI Analysis Modeling for Mobile Devices
- Analysis of SAR (Specific Absorption Ratio) Characteristics
- Electromagnetic Numerical Analysis Modeling
- Research of Electromagnetic Analysis Algorithm
- Research of Radiation Mode Control Technique in Mobile Devices

[Research]
Antenna for Mobile Devices, RFID Antenna, Small Antenna, EMI/EMC, CEM (Computational Electromagnetics)

[Subjects]
Undergraduate : Engineering Electromagnetics, Microwave Engineering, Antenna Design
Graduate : Advanced Electromagnetics, Mobile Antenna Design

[Education]
Ph.D., University of Texas, Austin, USA

[Career]
1993.3 ~ Present Professor at Hanyang University Fusion Electronics Engineering Department
1992.5 ~ 1993.1 Postdoctoral Fellow at University of Texas at Austin, USA
1989.5 ~ 1992.5 Research Assistant at University of Texas at Austin, USA

Hyeongdong Kim
Professor
Display Device Laboratory

1. Improvement of Display Performances
   • Advanced TN mode
   • Development of LC mode with High transmittance
   • Photo-aligned LC mode
   • Fast response LC mode and viewing angle control

2. Interfacial Phenomena
   • Pretilt control (Static & Dynamic)
   • DNA chip
   • Photo-reactive material & photo alignment
   • Alignment mechanism of organic molecules
   • Anisotropic phase separation

3. Organic Electronics
   • Organic TFT & Organic Electronics
   • Nano-structure
   • Solar cell
   • Interface treatment

4. Next Generation Displays
   • Polarized OLED
   • Dual LC mode
   • Transflective LC mode
   • Cholesteric LC for the application to E-paper
   • Flexible display
   • 3D display
   • Development of hybrid display mode
   • Transparent display

[Research]
Next Generation Display, Molecular Alignment Mechanism, Organic Electronics, Interfacial Phenomena
Wireless Systems Laboratory

1. Signal Processing for Wireless Communications
   • Channel estimation and detection
   • Massive MIMO signal processing
   • Acoustic communication signal processing
   • Adaptive signal processing algorithms

2. Wireless Positioning Systems
   • GNSS (Global navigation satellite system) receiver design
   • Range-free localization systems
   • Range-based localization systems
   • Indoor/outdoor seamless positioning systems

3. Joint Wireless Positioning and Communication Framework
   • Joint optimization for positioning and channel estimation
   • Location-based beam steering and optimization
   • Capacity analysis of location-based positioning system

4. Standardization of 3GPP
   • Small-cell/D2D/3D-beamforming

[Research]
Signal processing for wireless communications, Wireless positioning systems, Estimation & detection, GNSS

[Subjects]
Graduate: Random Process, Digital communication, Mobile communication.

[Education]
Ph.D., University of California, Santa Barbara, USA

[Career]
2012 ~ Present  Associate professor, Hanyang University
2008 ~ 2012  Assistant professor, Hanyang University
2005 ~ 2008  Full-time lecturer, Hanyang University
Tae Whan Kim
Professor

Nano Quantum Electronics Laboratory

1. Memory Devices
- Formation of the organic/inorganic nanocomposites and optimization of the nanocomposites
- Studies of nonvolatile memory devices using nanocomposites and electrical characteristics
- Studies of flexible nonvolatile memory devices using nanocomposites and electrical characteristics

2. Organic Light-Emitting Devices
- Electrical and optical mechanism of tandem organic light-emitting device with a charge generating layer
- p-i-n organic light-emitting devices
- White flexible organic light-emitting devices

3. Solar Cells
- Inorganic/organic hybrid photovoltaic cells
- Nanostructure organic photovoltaic cells
- Flexible organic photovoltaic cells

4. Device Modeling
- Trap layer of CTF devices
- Coupling effect of NAND flash memory
- High-k dielectric mobility degradation model
- MRAM devices

5. Fusion Devices
- Electronic and optoelectronic fusion devices
- Electronic and bio fusion devices
- Optoelectronic and bio fusion devices

[Research]
Memory Devices, Organic light-emitting Devices, Solar cells, Fusion devices

[Subjects]
Undergraduate: Modern Physics, Semiconductor Devices, Introduction of Solid State Electronics
Graduate: Quantum Electronic Engineering, Optoelectronic Devices, Nano Solid-State Physics, High-Speed Semiconductor Devices

[Education]
Ph.D., State University of New York, Buffalo, USA

[Career]
2007 ~ Present Distinguished Professor, Hanyang University
2006 ~ Present Regular member of the Korean Academy of Science Technology
2003 ~ Present Professor, Department of Electronic Engineering, Hanyang University
1989 ~ 2003 Professor, Department of Electrophysics, Kwangwoon University

[Research]
Memory Devices, Organic light-emitting Devices, Solar cells, Fusion devices
Whoi-Yul Kim

Image Engineering Laboratory

1. Object Pattern Recognition
   • Face/Eye detection
   • Face recognition
   • Fast pupil detection for mobile devices
   • Measuring bone age
   • Various inspection devices

2. Intelligent Surveillance
   • People Counting
   • Tracking moving objects
   • Automated object classification
   • Intrusion detection
   • Loitering object detection
   • Unattended object detection

3. Human Computer Interaction
   • Remote Eye gaze tracking
   • Gesture Recognition

4. Intelligent Vehicle
   • Forward collision warning system
   • Lane departure warning
   • Pedestrian detection and collision warning system
   • Autonomous vehicle

[Research]
Computer Vision, Pattern Recognition, Robot Vision, 2D/3D Vision systems, Surveillance Systems, Pattern Recognition, Object Recognition, 3D Display, Intelligent vehicle

[Subjects]
Undergraduate: Data Structure, Image Processing, Numerical Analysis
Graduate: Computer Vision, Pattern Recognition

[Education]
Ph.D., Purdue University, USA

[Career]
2015.3 ~ 2016.8 Director of LINC Project, Hanyang Univ.
2015.3 ~ 2016.2 Provost & Senior Vice President, Hanyang Univ.
   Dean of Graduate school, Hanyang Univ.
   Director of Volunteering Corps, Hanyang Univ.
2015.9 Commendation by Minister of Education for Industry-University Collaboration of Innovative Technology Show
2013.5 ~ 2015.5 Medical Device Expert, Ministry of Food and Drug Safety
2011.8 ~ 2015.2 President of Information and Communications, Hanyang Univ.
2011.4 Technical Forum Consultant, Hyundai MOBIS R&D Center
2010.11 ~ 2012.10 R&D Consultant, Seoul Metropolitan Rapid Transit Corporation
2010.9 Commendation by Prime Minister for Technical Innovation of Small and Medium Industry
2009.3 ~ 2011.2 Head, Dept. of Electronics & Communications Engineering, Hanyang Univ.
2000.3 ~ 2002.7 Director, Center of Information and Communications, Hanyang Univ.
1994.3 ~ Present Professor, Dept. of Electronic Engineering, Hanyang Univ.
1989.9 ~ 1994.2 Univ. of Texas at Dallas, Assistant Professor, Univ. of Texas
Integrated Electronic Laboratory

1. Display Electronics
   • Display driver ICs
   • High image quality AMOLED display
   • OLEDs microdisplay
   • Transparent display using IGZO and nanowire transistor
   • Smart LED driver IC and local dimming algorithm for LCD TVs using LED backlight

2. Power Electronics
   • SIMO DC-DC converter for mobile applications
   • AC-DC converter for LED lighting
   • High efficiency power and battery management ICs
   • HV devices and process integration of BCDMOS

3. High Speed Interface
   • Signal integrity for high-speed data transmission
   • Phase locked loop for low-jitter clock generation
   • Clock and data recovery circuit

4. Sensor Readout Technology
   • High speed and high bit-depth CMOS image sensor for digital single-lens reflex (DSLR) application
   • Touch screen panel and readout circuit
   • Ambient light sensors for mobile applications

5. Bio-Medical Electronics
   • Ultrasound interface IC for 3D ultrasound imaging
   • CMOS X-ray detector for medical CT applications
   • Bio-signal monitoring system for medical applications

[Research]
Display Electronics, Power Management IC, Battery Management Circuit, Power Electronics, High Speed Interface, Sensor Readout Technology, Bio-Medical Electronics
Sang-Sun Lee

[Subjects]
Undergraduate: Microelectronic Circuits, Automobile-IT Convergence Technology
Graduate: Communication Protocol Engineering, Mobile communication, VANET

[Education]
Ph.D., University of Florida, USA

[Career]
2008 ~ Present
Member, TTAPG310 ITS/Telematics Section Committee
2001 ~ Present
Korean Delegate, ISO TC204 WG16
1993 ~ Present
Professor of Department of Electronics Engineering, Hanyang University
1991 ~ 1993
Senior Researcher, Korea Electronics Technology Institute (KETI)
1990 ~ 1991
Postdoctorial Fellow, University of Florida

Ubiquitous Communication Research Laboratory

1. Research of VANET Protocol and Simulation
   • VANET (Vehicle Ad hoc Networks)
   • Design of Network and MAC protocols
   • Evaluation of designed protocol using VANET Simulator
   • Standardization for vehicle network technologies

2. Safety System Based on Vehicular Communications
   • Algorithm and scenario development for safety services based on WAVE
   • Model and message design for safety services
   • Vehicular safety systems and test-bed configurations

3. Wireless Positioning
   • Indoor Positioning Systems Based on WLAN RSSI Fingerprinting
   • Probabilistic Positioning algorithms
   • Error minimization algorithms for wireless positioning systems
   • Sensor-based Positioning System

4. GNSS Relative Positioning Using V2X
   • High Accuracy Positioning algorithms
   • Low Time Latency Communication algorithms
   • Low Cost System Design

[Research]
Vehicular Wireless Communication, Wireless Positioning, C-ITS, VANET Protocol
Seung-Beck Lee

Nanoelectronic Devices Laboratory

1. Biomimetic Tactile Sensors Enabled by Nanotube Networks
   • Biomimetic tactile sensors will realize quantitative analysis of surface tactile textures which have never been possible before. The sensor incorporates highly sensitive pressure sensors that senses the vibration transferred from the artificial fingerprint structures making possible analysis of tactile contact information, which may lead to
     - Quantitative classification of tactile sensation
     - Humanistic haptic feedback

2. On-chip Microfluidic Cell Sorting & Capture
   • Cell sorting microfluidic devices have normally been fabricated on glass substrates. Here, we have developed a method to incorporated microfluidics on top of an insulated Si substrates allowing application to
     - On-chip circulating tumor cell (CTC) capture
     - On-chip microfluidic cell culture and analysis.

3. Vertically Integrated 3D Silicon Memory
   • For further integration of memory, 3D memory structures have been proposed. Our interest is in reducing distribution due to polysilicon and devise new 3D memory structures. The related research topics are
     - 3D NAND Flash for beyond Tbit storage
     - 3D integrated DRAM structure research

[Research]
Electronic device application of natural and synthetic nanostructures
Hi-Chan Moon

Communication System Laboratory

1. Low-power Wireless Communication System
   • Packet data transmission based green wireless communication system

2. Communication Modem Design
   • 4G LTE terminal modem
   • Modem architecture and algorithm design for Next-generation wireless systems

   • Study on Improving frequency efficiency for next-generation wireless communication system

[Subjects]
Undergraduate : Linear Algebra
Graduate : Modem Design for Communication

[Education]
Ph.D., Stanford University, USA

[Career]
2011.3 ~ Present Assistant professor, Electronics Engineering, Hanyang University
1994.2 ~ 2011.2 Chief Engineer in Samsung Electronics (Modem architecture design for mobile telecommunication, communication standardization, cellular-based remote station design)

[Research]
Next generation (B4G, 5G) wireless communication system, Modem design for communication, Communication and Information theories

Tel.
02-2220-0357
E-mail.
hcmoon@hanyang.ac.kr
Sang-Won Nam

Signal Processing and Control Laboratory

1. Adaptive Signal Processing
   • Adaptive filtering with fast convergence
   • Efficient filter design for computational complexity reduction
2. Active Noise Control
   • Active noise reduction system (ANRS) and its application
   • Filtered-X ANC algorithms robust to outside noisy environment
   • Convex combination of a class of affine projection algorithms and projection order control scheme
   • Multi-channel ANC
3. Digital Filter Design
   • Computationally efficient digital filter design and its application
   • Adaptive equalizer and its development for mobile phone application
   • Filter bank for hearing aids
   • Research on array signal processing
4. Linear or Nonlinear System Identification
   • Identification of linear/nonlinear time-invariant systems
   • Identification of linear/nonlinear time-varying systems
   • Identification of sparse linear or nonlinear systems
   • Biomedical engineering
   • Volterra series representation of time-frequency distributions
5. Optimization Theory and Its Utilization
   • Development of optimization theory
   • Sparse digital filter design based on the optimization theory

[Research]
Digital signal processing, computationally efficient filter design, active noise control, nonlinear signals systems, system identification, equalizer, biomedical engineering
Jea-Gun Park

Advanced Semiconductor Material Device Development Center

1. Flexible Memory
   • Mobile flexible organic memory
   • 3-dimesional cross-bar organic resistance memory
   • Small-molecule rectified 1-resistance memory

2. STT-MRAM, Spin-neuron, CBRAM
   • Tera-bit next generation nonvolatile memory (perpendicular spin-torque-transfer MRAM)
   • Research on spin-neuron device and CBRAM

3. Strained Fin-FET
   • Research on sub-10 nm FinFET design by using strain-relaxed buffer (SRB) structure

4. Research on Nano Abrasive CMP slurry
   • Research on the CMP slurry for phase change material (GeSbTe)
   • Research on the CMP slurry of metal electrode [Ru and Ta] of STT-MRAM
   • Research on the CMP slurry for metal interconnect (W and Cu)
   • Research on the CMP slurry for silicon and silicon carbide

5. Organic C-MOS Image Sensor
   • High-resolution CMOS image sensor cell with green sensitive organic photodiode
   • Research of green sensitive organic layer as a photodiode and 4-Tr. CIS cells

6. Flexible Organic Solar Cell
   • Development of high efficiency wide absorption organic photovoltaic with surface plasmon effect
   • Development of organic, inorganic hybrid solar cell

7. LCD, LED, Solar Cell using Quantum-dots
   • Effects of metal contamination on PCE degradation for silicon solar cell
   • Nano-silicon-wired & nano-silicon-pillar solar cell

[Research]
Perpendicular STT-MRAM, CBRAM, Flexible polymer memory, Spin neuron, Strained Fin-FET,
Design of LCD, LED, UV & IR sensor using core/shell QD, Nano CMP slurry, Organic image sensor,
Flexible organic solar cell, Nano silicon solar cell, Sapphire

[Subjects]
Undergraduate: Physics of Solid State Electronics, Advanced Semiconductors, Semiconductor Fabrication, Capstone Design
Graduate: Green IT, Nano Semiconductor Process, Nanoscale Semiconductor Seminar

[Education]
Ph.D., Carolina State University, USA

[Career]
2015.06 ~ Present  Advisory Committee of Korean Patent Intellectual Property
2011.05 ~ Present  Distinguished Professor, Hanyang University
2015.01 ~ Present  Senior Member of National Academy Engineering of Korea
2010.11 ~ Present  Fellow Member of Korean Academy of Science and Technology
2008.08 ~2011.07  President of Industry-University Cooperation Foundation, Dean of University Research of Hanyang University, Head of Hanyang Institute of Technology
2008.04 ~2010.04  Committee Member (Korean President Advisor) of National Science & Technology Council
2008.03 ~ Present  Dean of Department of Nanoscale Semiconductor Engineering, Hanyang University
2004.07 ~2012.06  Chief Director of National Program for Terabit Nonvolatile Memory Development Sponsored by MKE
2003.04 ~ Present  Asian Chairman of SIWEDS [Silicon Wafer Engineering & Defect Science] Center
1999.03 ~ Present  Professor of Department of Electronics Engineering
Jin-Sub Park

Advanced Compound Semiconductor Optoelectronics Laboratory

1. High Brightness LED for Solid-State Lighting
   • High brightness LEDs using the hybrid compound semiconductors
   • Applications of surface plasmonic effects and graphene for HB LEDs
   • Nano- LED using (In)GaN nano structures

2. Advanced Compound Semiconductor LEDs
   • Growth and fabrication of high quality nonpolar/semipolarGaN based LED
   • Design of nano/QD hybrid structures with help of FDTD simulation
   • Fabrication of vertical LED and improvement of performance

3. Flexible Opto-Electronic Devices
   • Electronic devices (MOSFET, HEMT) using the III-Nitride semiconductors
   • Application of compound semiconductors to flexible optoelectronics
   • Graphene/Nitride for power devices

4. Low Cost and High Efficiency Solar Cells
   • Low cost and high efficiency compound semiconductor based (III-V, Nitride, oxide) solar cells
   • Hybrid solar cells using the Inorganic/Organic materials
   • Advanced next generation solar cells using the various core/shell nanostructures

[Subjects]
Graduate : Compound Semiconductor Optoelectronics

[Education]
Ph.D., Tohoku University, Japan

[Career]
2011.3 ~ Present  Assistant professor, Hanyang University
2010.4 ~ 2011.2  Research Prof., Seoul National University
2009.4 ~ 2010.3  Post Doc., University of California, Berkeley
2002.1 ~ 2006.1  Senior Researcher, Samsung electromechanics

[Research]
LED / Solar Cell, Power devices
Wireless Communications Laboratory

1. **OFDM**
   - Integer frequency offset estimation
   - New PAPR reduction scheme
   - Low computational complexity of PAPR reduction schemes
   - New constellation mapping scheme for OFDM

2. **MIMO**
   - Low computational complexity for fast antenna selection
   - New uplink multiuser detection scheme
   - SEC (Switched Examine-Combining)/MRC (MaximalRatio Combining) scheme

3. **Co-operative Relay**
   - Fixed relay transmission technology for 4G cellular network
   - Relay transmission scheme in 3GPP LTE system
   - Cell capacity maximization in cellular system using co-operative relay

4. **ITS / Telematics**
   - Performance improvement between OBU (On Board Unit) and RSE (Road Side Equipment)
   - Performance analysis of V2V (Vehicle To Vehicle) / V2I (Vehicle To Instrument) throughput
   - Performance analysis of UWB (Ultra Wide Band) and wireless USB (Universal Serial Bus)
   - Low cost design technique for wireless USB

5. **LTE**
   - Development of channel estimation algorithm simulator for 3GPP LTE downlink
   - Measurement of mean square error for 3GPP LTE downlink
   - Throughput for 3GPP LTE system
   - Interference cancellation scheme

[Research]
- LTE-Advanced, Mobile WiMAX, MIMO-OFDM, Co-operative relay, Bluetooth and UWB in Vehicular Communication

[Subjects]

[Education]
- Ph.D., University of Michigan, USA

[Career]
- 2006 – 2008 Director, Hanyang Univ. Office of Information and Communications
- 2001 – 2003 Vice President, Korea Institute of Information Security and Cryptology
- 1998 – 2006 Director, Korea Institute of Communications and Information Sciences
- 1994 – 1997 Director, Korea Communications Agency
- 1993 – 1999 Technical Advisor, S-1 Corporation
- 1987 – Present Professor, Hanyang Univ.
Sang-Gyu Park

Professor

Circuits and Systems Laboratory

1. ADC System for Digital Hearing Aids
   • Pre-Amplifier
   • ADC
   • Decimation Filter

2. Circuit Technology for STT-MRAM

[Research]
Mixed-Signal Circuits
Display Driving Circuits
Optical Transmission System
Optical Communication Network

[Subjects]
Undergraduate: Microelectronics, Optical communication, Digital Logic Design
Graduate: Mixed-Signal Circuits Design, Display Driving Circuits Design

[Education]
Ph.D., Purdue University, USA

[Career]
2011.9 ~ Present  Professor, Hanyang University
2006.8 ~ 2011.8  Associate professor, Hanyang University
2002.9 ~ 2006.8  Assistant professor, Hanyang University
2000.9 ~ 2002.8  Full time lecturer, Hanyang University
1998.12 ~ 2009.9 Los Alamos National Laboratory, Research affiliate
1997.6 ~ 1997.7  AT&T Labs-Research, Sr. Technical Staff Member
Convergence Communications Laboratory

1. Smart Car
   • Development for vehicle charging protocol and parallel reprogram technology based on PLC (Power Line Communication)

2. Digital Broadcasting
   • Development of real-time on-demand multimedia service transceiver system using a hybrid method
   • Research and Standardization of video gateway platform (3Screen)

3. Smart Work
   • Establishment of medium and long-term development plan for smart work
   • Research for present condition and frequency of utilization of smart work
   • Consideration of the plan about smart work
   • Establishment of smart work policy

4. Future Internet
   • Research of wired and wireless home network technology for gigabit Internet
   • Development and Standardization for Interactive Transmission System with Gbps Speed based on RF/PON

[Subjects]
Undergraduate: Computer Networks, Digital Communications
Graduate: Broadband Convergence Network, Neural Network

[Education]
Ph.D., Rensselaer Polytechnic Institute, Troy, USA

[Career]
2013.10 ~ Present Committee Member, Policy Advisory Committee of Korea Information and Communications Commission
2008.4 ~ Present Chairman, Korea Digital Cable Forum
2008.2 ~ 2011.7 Vice President, Office of Information and Communications in Hanyang Univ.
2008.3 ~ 2009.2 Vice Chairman, Special Committee for Information and Communications, National Assembly
2000.3 ~ 2005.2 Chairman, Digital Cable TV Steering Committee, Ministry of Information and Communications
1993.3 ~ Present Hanyang University, Electronics & Computer Engineering Department, Professor
1987.9 ~ 2003.1 Tennessee Technological University, Associate Professor

[Research]
Broadcasting Convergence Network, Future Internet, Vehicle Convergence Network, Smart Broadcasting
Wan-Jun Park  
Professor

Low Dimension Semiconductor Materials and Device Laboratory

1. Spin Electronics
   • Process parameter monitoring to improve characteristics of MTJ cell
   • Perpendicular magnetization characteristics of magnetic thin film materials
   • Thin film fabrication for MPP characteristic realization
   • Programmable nonvolatile spin logic device

2. Graphene / Nanotube
   • High quality graphene growth and graphene transfer technique
   • Fabrication of graphene transistor and its characteristics analysis for realization of high speed device
   • Logic circuit design using CNT
   • ab-initio calculation of graphene nanoribbon

3. Bio-Sensor
   • Charge transfer sensing FET for diagnosis of Circuit Cancer Stem Cell (CCSC)
   • Analysis of graphene/CNT surface
   • Research for reforming of graphene/CNT surface
   • Fabrication of resistance variation-sensitive bio-sensor

4. Tactile Sensor
   • Research on mechanical characteristics of nano- materials (Graphene/Nanotube)
   • Tactile sensor based on nano-structure
   • Neuromorphic device/architecture

[Research]
Nano-scale devices for electronic and bio-sensor applications with various kinds of nanomaterials, Device scaling in VLSI technology and spin electronics for non-volatile memory and logic architecture, Neuromorphic device/architecture

[Subjects]
Undergraduate: Semiconductor Physics, VLSI fabrication, Electromagnetism
Graduate: Solid State Physics, Spin Electronics

[Education]
Ph.D., University of Utah, USA

[Career]
2007 ~ Present  Professor, Hanyang University
1999 ~ 2007  Samsung electronics
1988 ~ 1992  LG electronics co.

Tel. 02-2220-4315
E-mail. wanjun@hanyang.ac.kr
http://smd.hanyang.ac.kr
Coding and Communications Research Laboratory

1. Memory Signal Processing
   • LDPC codes, Turbo codes, and concatenated codes for NAND Flash memories
   • Channel equalization techniques to reduce the intercell interference in NAND Flash memories
   • Signal processing techniques for the next-generation (non-volatile) memories

2. Communication Signal Processing
   • Low-complexity and highly reliable error-correcting and MIMO schemes for 4G and B4G systems
   • PAPR reduction schemes for OFDM and OFDMA systems
   • Cooperative schemes using MIMO and ECC at relay(s)
   • Interference cancellation / alignment schemes

3. Radar Signal Processing
   • OFDM radar signals to cover wide range of location and speed of targets
   • Efficient modeling of clutter and multi-path environments for acquiring and tracking fast and small target(s)
   • Radar techniques to avoid and mitigate the multi-path interference occurred from various environments

[Research]
Yong-Ho Song  Professor

Embedded and Network Computing Laboratory

1. Multicore SoC Design and Applications
   - Hardware Architecture for Multicores
   - Design of simulator for the analysis of multicore SoC
   - High-level design and verification methodology using the SystemC language
   - Task-level multimedia parallelization technique using OpenMP System
   - Thread-level multimedia parallelization technique
   - Using OpenMP System
   - Multicore SoC architecture for next generation video codec.
   - Design of on-chip networks for multicore SoC systems

2. Flash Storage Controller Design
   - Design of Controller for NAND flash storage systems
   - Design of hardware IPs for NAND flash storage systems
   - Design of software algorithms for NAND flash storage systems (mapping algorithm, garbage-collection algorithm, wear-leveling algorithm, buffer management algorithm, power failure recovery algorithm, etc.)
   - Simulators for high performance NAND storage systems
   - High performance SSD design on the PCIe interface.
   - Architecture design for next-generation NAND storage systems

[Research]
Multi-core SoC, Parallel Processing, Multimedia Processing, Flash Memory Storage Design

[Subjects]
Undergraduate: Microprocessor, Computer Architecture
Graduate: Multi-core SoC, On-chip Network, Embedded System Design

[Education]
Ph.D., University of Southern California (USC), USA

[Career]
2011 ~ Present  SoC Research Center, Director
2003 ~ Present  Hanyang University, Electronic Engineering, Associate Professor
1996 ~ 2002  Univ. of Southern California, Research Assistant
1991 ~ 1996  Samsung Electronics, Computer System Division, Research Engineer

Tel.
02-2220-1987
E-mail.
yhsong@hanyang.ac.kr
http://enc.hanyang.ac.kr
Intelligent Semiconductor System Laboratory

1. Bio Sensor and System
   • Research to detect Circulating Cancer Stem Cell (CCS) using EIS, ISFET EIS.
   • Research to investigate electrical and physical characteristics for CCSC

2. Future Nonvolatile Memory (PRAM)
   • Phase Change Switching Device
   • Multi-level cell technology using phase change memory

3. Future Nonvolatile Memory (STT-MRAM)
   • Selective device for STT-MRAM
   • MgO barrier reliability
   • 3D STT-MRAM architecture

4. Circuit Design for STT-MRAM
   • MTJ Macro Modeling
   • Core Circuit Design for STT-MRAM
   • Design method and algorithm to detect STT-MRAM failure

5. 3D NAND Flash Memory
   • Device Simulation for 3D NAND flash memory
   • Research to improve Program/Erase Speed in 3D NAND flash memory
   • ONO reliability and trap modeling

[Research]
Bio Sensor and System based on semiconductor technology, Future memory and logic device, Circuit design for memory chip
Il Hong Suh
Professor

Intelligence and Control for Robots Laboratory

1. Planning
   • Proactive Planning
     - Planning that performs required actions by predicting coming situations
   • Improvisational Planning and Reactive Planning
     - Planning that proposes alternatives in unexpected situations by using local information

2. Manipulation
   • Skill learning by imitation
     - Techniques to learn a complex and precise manipulation skill like a human
   • Grammaticalization
     - Techniques to reuse the basis skills variously, as the words did in Linguistics

3. Navigation
   • Line-based indoor SLAM
   • Navigation imitating humans
     - Localization depending on view points
     - Path integration, Reorientation
   • Semantic SLAM
     - Mapping by integrating topology and semantics

4. Recognition
   • Hierarchical, Interactive Recognition & Segmentation framework
   • Category learning and recognition
   • Activity learning and recognition
   • Object learning and recognition

[Subjects]
Undergraduate: Artificial Intelligence, Intelligent System, Signals and Systems
Graduate: Computational Intelligence Theory, Probabilistic Intelligence, Special Topics on Intelligent Systems

[Education]
Ph.D., KAIST, Korea

[Career]
2016.1 ~ Present Fellow, IEEE
2015.3 ~ Present President, Brain Engineering Society of Korea
2013.10 ~ Present Professor, Dept. of Electronic Engineering, Hanyang University
2013.1 ~ Present Senior Member, NAEK
2010.6 ~ 2013.9 Editor-in-Chief, International Journal of Intelligent Service Robotics (Springer)
2009.5 ~ Present Leader, National Robotics-Specialized Education Consortium (RoSEC)
2008 President, Korea Robotics Society
2000.3 ~ 2010.9 Professor, Dept. of Computer Science and Engineering, Hanyang University
1985.3 ~ 2000.2 Professor, Dept. of Electronic Engineering, Hanyang University (Erica)

[Research]
Cognitive robotics and control
Integrated Circuits Laboratory

1. Data Conversion Technique
   • Low-power digital Class-D amplifier
   • Time-domain analog-to-digital converter
   • Continuous-time sigma-delta modulator

2. Memory Interface Circuits
   • Modeling of memory interface channel
   • Skew compensation circuit for next-generation memory
   • Clock generation technique with DLL and PLL
   • Inductively coupled link for 3-D memory

3. High-Speed Serial Link
   • Universal physical layer
   • Low power voltage-mode driver
   • Phase rotating PLL
   • Clock recovery technique
   • Decision feedback equalizer

4. Power Management IC
   • Wireless power transmission technique
   • Multi-phase DC-DC converter for mobile applications
   • Power factor correction IC
   • Synchronous rectification IC

[Research]
Analog and mixed signal SoC
Mobile and Space Communications Laboratory

1. Communication
- New modulation/demodulation techniques
- High order modulation schemes
- Optimum bits-to-symbol mapping and signal constellation
- MIMO (Multiple-Input Multiple-Output) techniques

2. Military Communications
- Agile pattern generation
- Spread spectrum and high anti-jamming communications
- Signal processing for parameter variable radar

3. Satellite and Space Communications
- Deep space communications system
- Improvement of transmission efficiency of satellite broadcasting and communication systems
- Algorithms for low power operation and optimal performance
- FPGA implementation

4. IT-Automobile Convergence Technology
- D to D sensor network communications
- The reconstruction algorithms for real-time malfunction
- Intelligent automobile communication system

5. Signal Intelligence
- Estimation of communication parameters for unknown signals
- Blind detection of unknown telemetry signals
- Automatic classification of digital modulation schemes

[Research]
Digital Communications Theory and Systems, Wireless and Mobile Communications, New Modulation/Demodulation Techniques, Satellite and Space Communications, Military Communications, ITS, Signal Intelligence
Chang-Jae Yu
Professor

Novel Display Laboratory

1. Microlens Devices
   • Principle and fabrication of microlens devices by using various methods
   • Optical devices with dual focusing of microlens array
   • Fresnel lens by using Electrohydrodynamic (EHD)

2. 3D Display
   • Patterned retarder film and 3D device based on that.
   • 3D LC display with single polarizer.
   • Stereoscopic 3D display with Cholesteric liquid crystal

3. Enhancement of Electro-Optical Performances of Display Device
   • Enhancement of LC mode By using reactive mesogen
   • Development of LC mode with high transmittance
   • Development of LC mode with wide viewing angle

4. Organic Devices
   • Organic TFT based on pentacene
   • Correlation between molecular alignment layer and performance of OTFT device.
   • Development of fabrication method of high performance OTFT by using Gate insulator mixture
   • Enhancement of OTFT performances by hybrid insulator

5. Flexible Display
   • Flexible BCSN display mode
   • Stabilized Structure of Flexible display
   • Flexible e-paper

[Research]
Display Device, Organic TFT, flexible LCD, Microlens Devices

[Subjects]

Undergraduate: Introduction to Information Display, Electromagnetism, Modern Physics, Color Engineering
Graduate: Physics of Liquid Crystals, Color Engineering

[Education]
Ph.D., Seoul National University, Korea

[Career]
2016 ~ Present Executive Director of Korea Information display society
2016 ~ Present Associate Editor of Optics Express
2014 ~ Present Editorial director of Korea information display society
2011 ~ 2012 Editor of Korea information display society
2011 ~ 2012 Editor of optical society of Korea
2011 ~ Present Head professor of department of information display engineering, Hanyang university
2007 ~ Present Associate professor of department of electronic engineering, Hanyang university
2006 ~ 2007 University of Illinois at Urbana-Champaign post-doc
2005 ~ 2006 IResearch fellow of department of semiconductor joint research institute, Seoul national university.
2005 Lecturer at Hanyang university and Sejong university
RFIC and Antenna Laboratory

1. RFICs
   • UWB transceiver
   • Tunable / switchable / reconfigurable receiver
   • Mm-wave communication transceiver
   • 24 GHz automotive radar, GPR/WPR radar
   • Multi-band (S/X/Ka bands) transceiver for space communication
   • MMICs for 10 / 40 Gbps optical transceiver

2. Antennas
   • MIMO reconfigurable antennas for small handset
   • Quad-band antennas for communication and broadcasting
   • T-DMB / DVB-T / DVB-H / LTE antennas

3. Device Modeling
   • High-frequency equivalent-circuit modeling for MLCCs, DC-DC converter, PIN diodes, varactors, etc

4. Hybrid ICs
   • Highly efficient inverter module using piezoelectric devices for CCFL driving
   • LNA integrated with a GPS antenna
   • 2.5 / 10 Gbps optical transceiver

5. Transceiver Systems
   • Wideband phased-array antenna systems
   • Giga-bps optical transceivers

[Research]
RFICs, MMICs, Antennas, Radar, Phased-Array Antenna, Wireless/Satellite/Optical Communication Transceiver
Sang-Keun Park
Professor

[Research]
1. Mobile Communications Terminals and its Applications
2. Role of IT in Future Society

[Subjects]
Undergraduate: Electromagnetic Theory, Advanced Engineering Mathematics, Linear Algebra, Microelectronics Circuits

[Education]
Ph.D., Polytechnic Institute of NYU, U.S.A

[Career]
2012 ~ Present  Professor, Hanyang University
2008 ~ 2011  Specialist Professor, Korea University
2006 ~ 2008  BoD member for OMA (Open Mobile Alliance)
2006 ~ 2008  BoD member for NFC-Forum
2006 ~ 2008  Consultant, SAMSUNG Electronics
2004 ~ 2006  BoD member for MRF (Mobile RFID Forum)
2003 ~ 2004  NTT DoCoMo’s R&D Technical Advisory Board Member
2003 ~ 2005  Korean Telematics Business Association, Chairman
2000 ~ 2005  Senior VP, SAMSUNG Electronics.
1999 ~ 2005  3GPP TSG-Terminals Chairman
1995 ~ 2000  Vice-President, SAMSUNG Electronics, Wireless Terminals Division & Telecom R&D Center
1987 ~ 1992  Adjunct Professor, Polytechnic University
1984 ~ 1995  Staff Engineer, LORAL ELECTRONIC SYSTEMS (Lockheed-Martin), Yonkers, New York
1980 ~ 1984  Senior Engineer, RAYTHEON, Special Microwave Devices Operation (SMDO)
David P. Wagner  

[Research]
1. Data Structures
2. Computational Geometry
3. Algorithms
4. Software Design
5. Compilers

[Subjects]
Undergraduate: Data Structures, Operating Systems, C Programming, Microprocessors, Algorithms

[Education]
Ph.D., Dartmouth College, USA

[Career]
2012 ~ Present  Assistant Professor, Hanyang University
2008 ~ 2011  Assistant Professor, Korea University
2006 ~ 2008  Software Design Engineer, Microsoft Corporation, Redmond, WA
2006 ~ 2006  Intern, Google, Mountain View, CA
2000 ~ 2000  Intern IBM Tokyo Research Labs, Tokyo, Japan
1996 ~ 1998  Technical Support Engineer, JYACC/Prolifics, New York, NY
1990 ~ 1991  Intern, Asea Brown Boveri (ABB), South Windsor, CT
Power of Thinking
Technology for a Next Generation Smart Phone

Technology for a LCD TV

Technology of PMIC for a Digital TV
Technology of Ground Radiation Antenna for a Mobile Device

Technology of Signal Process for a High-Quality Audio Communication Dual Microphone

Technology of MPEG4

Technology for Ubiquitous Transportation

Technology for a Non-Copyable Credit Card

Technology for a Next Generation STT-MRM Memory
Scholarship Foundation

Supporting scholarships for many students

For students to focus on study and research, regardless of their environment, various scholarship and support systems are available. The majority of the undergraduate students receive benefits from the scholarship system.

2016 1st semester Department of Electronic Engineering scholarship awards (won)

<table>
<thead>
<tr>
<th></th>
<th>No. of students</th>
<th>In-school scholarship</th>
<th>Out-of-school scholarship</th>
<th>Total scholarship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>119</td>
<td>Students</td>
<td>69</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amount</td>
<td>859,427,000</td>
<td>350,742,500</td>
</tr>
<tr>
<td>Sophomore</td>
<td>126</td>
<td>Students</td>
<td>33</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amount</td>
<td>132,881,000</td>
<td>16,310,000</td>
</tr>
<tr>
<td>Juniors</td>
<td>133</td>
<td>Students</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amount</td>
<td>75,710,000</td>
<td>6,540,000</td>
</tr>
<tr>
<td>Seniors</td>
<td>183</td>
<td>Students</td>
<td>42</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amount</td>
<td>232,881,500</td>
<td>13,800,000</td>
</tr>
<tr>
<td>Total</td>
<td>561</td>
<td>Students</td>
<td>168</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amount</td>
<td>1,300,899,500</td>
<td>387,392,500</td>
</tr>
</tbody>
</table>

To enable the best education and research, and to secure excellent students and faculties, finances are secured through alumni or donation from companies and organizations.

<table>
<thead>
<tr>
<th>Scholarship</th>
<th>Recommendations</th>
<th>No. of students</th>
<th>Scholarship amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alumni of Hanyang University Electronic Information and Communications</td>
<td>Student who is excellent in academic scores and has difficult family circumstances, and received recommendation from the head of the department or the college</td>
<td>1</td>
<td>3,000,000 won</td>
</tr>
<tr>
<td>Lee Sang Wan scholarship</td>
<td>Student with excellent academic scores over average grade of 3.75 (4.0 for graduate school) in the last semester, and has difficult family circumstances, and received recommendation from the head of the department or the college</td>
<td>2</td>
<td>Total tuition + book fees (400,000 won)</td>
</tr>
<tr>
<td>Lee Ga Young scholarship</td>
<td>Student with excellent academic scores and has difficulty in raising tuition, and received recommendation from the head of the department or the college</td>
<td>2</td>
<td>Total tuition (Support of total tuition until graduation when the academic score is maintained 3.0 or more)</td>
</tr>
<tr>
<td>Special scholarship (Scholarship by the scholarship committee of the family of late Professor Kim Kyung Ki)</td>
<td>Student with difficult family circumstances, but is a good example to others / Average score of 3.5 or more in all grades</td>
<td>1</td>
<td>1,000,000 won</td>
</tr>
</tbody>
</table>

Inquiry on donations: Office of International Cooperation, Hanyang University +82-2-2220-0046
Inventing the Future

Outstanding scientists and engineers create the icons of the times and revolutionize our lifestyle. At the hands of passionate and skillful engineers, a magic beyond our imagination can unfold. Because of the insatiable challenges today, our possibilities are endless. Through their passionate and challenging spirit, the excellent engineering students of the Department of Electronic Engineering-convergence in electronics will take the lead in creating new technology, which enriches our lives and revolutionizes the industry.