Department of Unmanned System Technology

1. Educational Goal

1) Training advanced manpower to lead unmanned system technology and related high-value-added technology industry where demand for defense and private sector is increasing rapidly

2) To cultivate professional manpower in the area of strategic / professional industries such as defense ICT / optoelectronics convergence / robot automation / wireless communication convergence / intelligent machine in response to demand of emerging community and local industry

2. Educational Objectives

1) To acquire creative engineering design skills, actively cope with changing environment, and cultivate the ability to apply engineering-based fusion technology.

2) Be trained to fulfill social and moral responsibility as a Christian through self-innovation during the rest of his life.

3) We nurture expertise with agile sense of sense and teamwork spirit in global society living together.

3. List of Full-time Faculty

Name	Position	Degree(University)	Field of Instruction	Area of Research
Bong-Su Kang	Professor	Engineering (Korea Advanced Institute of Science and Technology	Robotics	Robot design Intelligent control
In-Ha Sung	Professor	Engineering (Yonsei Univ.)	Design, production	Ultra precision machining, Tribology
Yong-Taek Lee	Associate professor	Engineering (Korea University)	Thermal and steric engineering	Heat transfer, renewable energy
Choung-Hee Nam	Associate professor	Engineering (Gwangju Institute of Science and Technology)	Magnetic sensor	Magnetic sensors and materials
Dae-Rac Son	Professor	Engineering (Germany Hamburg Univ.)	Measurement engineering	Sensor Engineering
Chun-Suck Lim	Professor	Natural Science (Korea Advanced Institute of Science and Technology)	Applied Optics	Optical system design
Jae-Heung Jo	Professor	Natural Science (Korea Advanced Institute of Science and Technology)	Applied Optics	Optical measurement
Sung-Han Ryu	Professor	Engineering (POSTECH)	Electronic circuit	RF system, IC circuit design
Yung-Sun Yun	Professor	Engineering (Korea Advanced Institute of Science and Technology)	Speech recognition	Voice information processing, mobile programming
Sung-Bae Eun	Professor	Engineering (Korea Advanced Institute of Science and Technology)	Computer architecture	Wireless communication, system software
In-Sick Choi	Professor	Doctor of Engineering (POSTECH)	Radio Engineering	Radar, signal processing
Jin-Man Jung	Associate professor	Doctor of Engineering (Seoul National University)	operating system	Embedded Software

4. Course Description

1) Commonness

<Basic>

• US601 Computer Aided Design 3 credits

Computer definition of products by geometric modeling, computational geometry of curves and surfaces, solid modeling, and topology modeling are introduced. Practices on related computer graphics and their programming are presented with technology related to product data in addition to geometric data and STEP, PDM as a tool for a means of product management etc.

• US604 Applied Mathematics 3 credits

Mathematics for the advanced level of engineering analysis such as linear algebra, calculation of variations and applications, integral equations, etc. are presented.

• US605 Production Management 3 credits

Statistical methods, optimal schemes related to quality management, supply control for effective production management are presented and simulation tools are dealt to improve the problem-solving capability of students.

• US610 Working-level English 3 credits

To enhance the language capability of a engineer engaged in management, research, marketing field, etc., contents related to reading, listening, speaking are introduced and studied systematically.

• US611 Business Administration 3 credits

A theory and introductions to business administration addressing financial management, personal management, marketing, production arrangement etc. are presented.

<Practice>

• US606 IIoT Project Practice I 4 credits

This course presents data exploration and acquisition, feasibility verification, concept design, element design, project management, communication, presentation practice to take a step for the preliminary stage of a capstone design project.

• US607 IoT Project Practice II 4 credits

This course presents manufacturing and assembly, performance verification, and function demonstration based on the concept design. This course helps students improve the problem-solving capability required from industrial sectors.

• US608 IoT Industrial Site Practice I 3 credits

This course places students on real industrial area to take a part in design work and the manufacturing process. Through this course, students improve their working-level capability and problem-solving technique by actual hand-on experiences.

• US609 IoT Industrial Site Practice II 3 credits

This course places students on real industrial area to take a part in design work and the manufacturing process. Through this course, students improve their working-level capability and problem-solving technique by actual hand-on experiences.

2) Optomechatronics

<Intermediate level >

• US701 Fundamental Electronics Engineering 3 credits

This course studies fundamental electronics for sensor applications. Topics cover physical properties of conductors, semiconductors and insulators for electrical/electronic devices.

• US702 ISelected Topics in Internet of Things Sensors 3 credits

Sensors, which are used in a wide variety of applications, such as smart mobile devices, automotive systems, industrial control, healthcare, oil exploration and climate monitoring, present a more accurate and reliable information in IoT environment than one would get by operating as each discrete sensor. This course is combined with series of lectures and seminars related to sensors in IoT environment.

• US703 Smart Sensors 3 credits

This course studies various smart sensors utilized in mobile devices and home applications. Topics cover general characteristics of smart sensor regarding healthcare monitoring, mobile & portable sensors etc..

• US704 Selected Topics in Modern Optical Engineering 3 credits

This course studies optical engineering with a interdisciplinary standpoint. Topics cover geometrical optics, wave optics, and laser optics.

• US705 Selected Topics in Optical Communications 3 credits

This course studies the fundamental structure and basic theory of optical waveguides, basic theory of luminescence of semiconductor Laser for optical communications, optical modulation and demodulation, OEIC, optical communication device and system, etc.

• US703 Selected Topics in Sensor Iinstrumentology 3 credits

For the sensor engineering, measurement techniques of the electrical signals are the important bases for the characterization & the improvement of the sensors,
commercialization, and quality control (Q/C). The principles of the measurement
techniques will be given together with the computer interface, data analysis on the device characteristics.

• US707 Special Topics in Thermo Fluids 3 credits

This course treats up-to-date thermo-fluid technology for academic and industrial aspect of view. This course is combined with series of lectures and seminars related to thermodynamics, fluid mechanics, heat transfer, and combustion area.

• US708 Micro/Nano-Fabrication 3 credits

This course introduces theories and technologies of micro/nano-fabrication. Lectures focus on basic processing techniques such as photolithography, nano-imprinting, SPM(Scanning Probe Microscopy)-based nanolithography, and more about ultra-thin film deposition. Students are expected to gain an understanding of these processing techniques, and how they are applied in device fabrication.

<Intensive course>

• US709 Advanced Optical Sensors 3 credits

This course studies sensor applications based on optical technology. Topics cover principles and physical properties of optical technology as well as sensor applications.

• US710 Advanced Electronics engineering 3 credits

This course studies advanced electronics for sensor applications. Topics cover physical properties of conductors, semiconductors and insulators for electrical/electronic devices.

• US711 Application of Mechatronics 3 credits

This course is designed to give graduate students the ability to understand basic principles of microprocessors and their applications to intelligent machine design. Contents of this course include analog signal processing, microcontroller programming, data acquisition, sensors and actuators.

<Practice>

• US712 IoT Sensor Device Design and Practice 4 credits

This course studies basic principles and operation of sensor devices, electronic circuits and system in IoT environment. In addition, design and simlation method using simulation software tool is also covered.

• US713 IoT Sensor Device Manufacturing 4 credits

In this course, students manufacture IoT sensor devices using PCB prototyping machine and semiconductor circuits, etc. based on simulation software tool design results.

• US714 Optical System Design and Practicie 4 credits

This course studies advanced geometrical optics. Topics cover the general theory of geometrical optics, computer programming of paraxial and skew ray tracing, and aberration theory with optical design for typical type lenses.

• US715 Sensor Design and Practice 4 credits

This course studies sensor applications based on MEMS technology. Topics cover general properties of MEMS technology and their various sensor applications. In addition, this course studies automobile sensors in terms of various utilities. Topics cover general characteristics of various automobile sensors.

• US716 Industry Experts Guidance 3 credits

Newly developed technologies and their future perspective will be addressed by invited experts in industry. This course emphasizes on providing the graduated students with an opportunity to learn about emerging trends and focus on their studies in specific areas. In the process, students' research and the relevant experiments will be reviewed and discussed, and their way to progress will be decided.

• US717 Research on Companies in Demand 4 credits

In this course, students analyze the technology and market trends of the company in demand and regularly visit the company to understand industry field. Basic research paper will be written by students with feedback of the company in demand.

3) Embedded System

<Intermediate level>

• US718 PPCB Layout and Fabrication 3 credits

The course will cover specification and classification of PCBs, techniques of layout design, artwork generation methods, specification design standards. The key focus is to go through to the complete design cycle from concept, to circuit design, layout, and verification, to testing and demonstration of practical printed circuit board (PCB) design.

• US719 Analog Integrated Circuits 3 credits

Covers CMOS analog integrated circuit design techniques using hand analysis and SPICE simulation, reviews the operation of single transistor amplifiers such as CS CG CD amplifiers, frequency response and stability, noise analysis, bandgap voltage source and current source bias circuits, single-ended and fully-differential CMOS OP amp circuits, switched capacitor filter, phase locked loop and delay locked loop.

• US720 Advanced Microwave Engineering 3 credits

This course covers theory of transmission lines, waveguides, scattering parameter, impedance matching and design of microwave components such as microwave resonators, power dividers, directional couplers.

• US721 Wireless Communication System 3 credits

Wireless communication is one of the hottest topics in recent communication industries from the viewpoint of both service and technology. Developments of technologies for high speed wireless digital communication are actively being undertaken. In this course technologies for various wireless communication systems are overviewed, and standardization activities as well as industry trends are surveyed. Examples of topics to be covered are types of wireless communication, wireless communication equipments, channel characteristics of the

free space, antennas, wireless LAN, mobile communication systems, satellite data communication systems, digital radio broadcasting, etc.

• US722 Wireless Sensor Technology 3 credits

The objective of this course is to introduce modern sensor technologies and their applications in practice. The course will focuses on some sensor operational principles, basic electronics, and many specific examples of sensors available from suppliers today. In particular, the course includes the emerging field of wireless sensor networks, which consist of many tiny, low-power devices equipped with sensing, computation, and wireless communication capabilities.

• US723 Communication Theory 3 credits

This course provides an introduction to the core theories and techniques for efficient communication engineering. Signal representations either in time or frequency domains, digital or analog modulation of signal, channel encoding, source encoding, information theory, estimation and decision theory, and some examples of communication systems are covered in this course.

<Intensive course>

• US724 Advanced digital signal processing 3 credits

This course provides graduate students studying electric engineering, electronics, and communication engineering with the theory of digital signal processing and its applications. It presents fundamental concepts of digital signal processing, discrete signal and system analysis, Z-transform, Discrete Fourier Transform, Fast Fourier transform, IIR and FIR Filter analysis and design, DSP application examples.

• US725 Special Topics on Signals and Noise 3 credits

In this course, students will study fundamental principles of probability, random variables and random signals to deal with system involving random process and noise through mathematical analysis and computer simulations. Main issues to be covered are as follows; probability mass/density function, characteristic function and statistical moments of random variables; random processes and sequences of random variables; properties of commonly encountered random processes; correlation and spectral analysis; linear systems with random inputs.

• US726 Special Topics on Operating Systems 3 credits

This course is a graduate course on operating systems, and more broadly, software systems in general. This course will cover a broad spectrum of research topics in systems, starting from traditional OS issues and ending with web-related systems. The class will consist of two major thrusts: reading and reviewing research papers, as well as doing a research project of your own.

<Practice>

• US727 Embedded Linux Kernel and Practice 4 credits

This course will introduce you the fundamentals of embedded Linux kernel and teach you how to develop for the Linux kernel. Issues such as development tools, Linux kernel and user-space, Linux system calls and library functions, Linux kernel scheduler CFS, memory management, and firmware debugging will be discussed. Students will be expected to do kernel programming projects involving modifications to the kernel source code

such as scheduling, system call, device drivers.

• US728 Wireless Sensor Protocol and Practice 4 credits

The objective of this course is to understand protocols and architectures for wireless sensor network design. It covers wireless sensor node and network architectures, and communication protocols in data-link, network, and transport layers. The course will discusses focused topics for wireless sensor networks such as code updates, mobility issue, time synchronization, localization, and topology management.

• US729 Design and Practice of Wireless Sensor 4 credits

The aim of this course is to train students in methods of design, implementation and operation of wireless sensor systems. This includes sensor networks, advanced sensor conditioning methods, smart sensor systems and error analysis. Also reliability, electrical safety and electromagnetic compatibility issues are covered. As a result, the students will be able to take advantage of sensor design techniques and master sensor internals through practice.

• US730 Industry Experts Guidance 3 credits

Newly developed technologies and their future perspective will be addressed by invited experts in industry. This course emphasizes on providing the graduated students with an opportunity to learn about emerging trends and focus on their studies in specific areas. In the process, students' research and the relevant experiments will be reviewed and discussed, and their way to progress will be decided.

• US731 Research on Companies in Demand 4 credits

In this course, students analyze the technology and market trends of the company in demand and regularly visit the company to understand industry field. Basic research paper will be written by students with feedback of the company in demand.

• Research for the Master's Degree I)

Research activities to prepare a thesis for the degree of Master

• Research for the Master's Degree II)

Research activities to prepare a thesis for the degree of Master