

Dept. of Sports Engineering Convergence

The Department of Sports Engineering Convergence (SEC) is established to train professionals who are interested in converging sport science to engineering. It provides a knowledge and skills of the exercise science and kinesiology as well as engineering in general, which are appropriate in applying to sports industry. The demand of sports industry is emerging in the area of health, safety, and environmental services anchoring kinesiology and mechanical engineering. While the sociocultural environment is ever changing, a demand of human oriented services, platform, hardware, and software are growing enormously. SEC focuses on training human resources targeting knowledge building, skill improvement, and field experiences. SEC offers two major fields; 'Convergence Kinesiology Major' and 'Convergence Mechanical Engineering Major'. Students are free to select one of the two majors, and will earn one of two academic degrees; 'Master of Science' or 'Master of Engineering'.

Courses

Core Courses

- **Sports Science and Industrial Technology**

Understand the concept, relationship and application of sports, sports science, sports engineering and sports technology.

- **Sports Engineering Convergence Seminar I**

Topical issues worth sharing will be given for students.

- **Sports Engineering Convergence Seminar II**

Presentation and debates will be given for students.

- **Sports Industry Field Practice**

Students will experience dynamic aspects of sports industry and understand the practical demands of the business for sports engineering. Students are expected to gain field experiences at sports related locations.

- **Research Ethics & Thesis Study**

Students will understand research ethics which is required in dealing with humans in sports engineering and how they proceed a research thesis in the regards. Whether

approaches of engineering toward social demands can correspond positively and actively to agendas of sport ethics are examined. How competition and sportsmanship, gender equality and disability, ethics and cultural background, commercialization and sports values can be related to engineering will be studied.

□ **Convergence Kinesiology Major**

• **Dynamics of Sports**

Mechanisms of human body dynamics related with sports and health care are studied. Understand the concept and application of the human movement mechanics for development and evaluation of various sports equipment.

• **Sports Media System**

Students will understand how the ever expanding media system in modern society would impact on sports and learn how the system could be applied to sports.

• **Sports Biomimetics**

Morphologic construction and ecological world of nature and human bodies are explored and studied. Possibility of application of natural structure on human body as well as on nature-friendly mechanical engineering is evaluated. Applicability of biomimetics on sports world will be assessed.

• **Big Data Analysis in Sports**

Through this course, it is able to obtain the knowledge of what the big data is in the multidisciplinary studies in sport, health, and rehabilitations. The students are able to apply the knowledge and skills of the big data analysis to the field by learning statistical analysis methods (e.g., R, SAS, etc) and theoretical models.

• **Sports Center Management Service Technology**

Students will understand importance of service management in sports center and learn what elements should be considered for effective center administration.

• **Research Methods in Sport Engineering**

Various research designs and methods applied in sport engineering are introduced

and practiced within the classes so that the students can conduct their own research studies.

- **Human Energetics**

The aims of this course are to understand energy system for movements of human body by applying metabolic changes and biochemical mechanisms to mechanical systems designed and to learn energy economics and nutritional benefits in mechanical systems based on the mechanisms.

- **Sports Wear**

This course is designed both for enrolled graduate students at sports engineering program in Kook-Min university and sportswear industry personnel. Students will learn to design sportswear (sports apparel, sports goggles, sports shoes, etc) based on functionality, human performance, aesthetic sense, and environmental challenges.

- **Sports Rehabilitation**

Students will learn how to rehabilitate various types of injuries and damages effectively which could be happened in sports field and what kinds of techniques and methods will be delivered for the purpose.

- **Sports Car**

Students will learn characteristics and functions of sports car and explore modality pursuing of the human safety and performance.

- **Convergence Mechanical Engineering Major**

- **Sports Engineering Research**

Students will learn how to pull out research agenda which could be studied in sports engineering and learn how to solve the problems.

- **Trends in Sports Engineering**

Current trends of sports engineering including sports gear, equipments, and rehabilitation tools will be examined. Cutting edge ideas in academic and industrial terms will be discussed.

- **Rehabilitation and Robotics**

The state of art and core technology of rehabilitatin Robots in the sports and medical fields are studied. And, motion of rehabilitation robots are studied based on the structure and movement of a human.

- **Mechanism Design for Sports and Rehabilitation**

The mechanism design for sports and rehabilitation is studied. Basic theory for the mechanism design is covered. The case studies for mechanism for sports and rehabilitation is introduced. The final term project should be carried for the mechanism design practice.

- **Sports Industry and IT Technology**

Students will learn how sports industry and IT technology could be converged and understand methods and techniques of field application.

- **Sports Industry and Electronic Engineering**

Students will learn how sports industry and electronic engineering could be merged and understand methods and techniques of field application.

- **Sports Bioengineering**

Basic theory, concept and terminology of biomechanics related with sports are introduced and how the theories of bio-solid and bio-fluid mechanics are applied on the bio-system and human body will be studied. Especially, the theme of contact mechanics which acted in human body or sports action will be studied.

- **Sports Sensor, Measurement and Analysis**

Based on the understanding for various sports related sensors and measurement techniques, the evaluation methods for body and sports performances are studied.

- **Sports Thermal Fluid Engineering**

Based on the theoretical understanding on the heat, energy and fluid drag force, student can learn about the design method to improve the efficiency of sport utility and the performance of competition ability.

- **Do-it-yourself for Sports Equipment**

This course deals with sports equipments in aspects of manufacturing engineering. Among the required features such as performance, aesthetic design, price-competitiveness, eco-friendliness, the course particularly focuses on price and safety. Designing and manufacturing experience in classroom, as termed as DIY (Do-it-yourself), will be attempted.

- **Design and Evaluation in Sports Equipment**

Mechanical designing techniques and evaluating methods for sports equipments will be reviewed in this course. Historical evolution and features will be discussed in the classroom.

- **Application of Advanced Materials in Sports Products**

Applications and case studies of advanced materials in sports- or health-related products are studied. The course deals with materials selection basing on the mechanical behavior of sports-related products such as elastic, plastic or failure-limited design. The case studies that how the advanced materials are contributed to improve the record of player will be also studied.

- **Sports Wearable Device**

The hardware and working principles of various sports and health related wearable devices are studied. Smart wearable coaching systems for the feedback coaching through expert systems can be designed and fabricated.

- **Sports Intelligent Design**

This course introduces recent theories and systems for sports related 3D solid modeling. We study the latest sports intelligent design techniques combining with information technologies such as an artificial intelligence and virtual reality applications.

- **Fitness Facility Design and Leveraging Technology**

Given in this course are planning, design, construction, maintenance, and management of sports facilities such as athletic ground tracks, swimming pool, and fitness room.

□ Faculty Members

Lee, Dae Taek

Florida State Univ., Ph.D.
Exercise Physiology
dtlee@kookmin.ac.kr

Lee, Miyoung

Univ. of Illinois at Urbana-Champaign, Ph.D.
Measurement and Evaluation in Kinesiology
mylee@kookmin.ac.kr

Lee, Kun Sang

Berlin Univ., Ph. D.
Human Engineering
kslee@kookmin.ac.kr

Si-Hyung Lim

UC Berkeley Univ., Ph.D
MEMS/NEMS
shlim@kookmin.ac.kr

Jayil Jeong

Seoul National Univ., Ph. D.
Intelligent Mechanism
jayjeong@kookmin.ac.kr

Cha Joo-Heon

Tokyo Institute of Technology, Ph. D.
Sensor
cha@kookmin.ac.kr

Lee, Joohyung

Univ. of Massachusetts Amherst, Ph.D.
Exercise Biochemistry & Nutrition
jolee@kookmin.ac.kr

Kim, Tae-Woo

Pennsylvania State Univ., Ph. D.
Engineering Mechanics
twkim@kookmin.ac.kr

Kim, Tae Ho

Texas A&M Univ., Ph. D.
Element Design
thk@kookmin.ac.kr

Cho Baek-Kyu

KAIST, Ph. D.
Human Robot
swan0421@gmail.com

Lee, Kee Sung

KAIST, Ph. D.
Materials
keeslee@kookmin.ac.kr

Shin, dong hoon

KAIST, Ph. D.
Environmental Engineering
dhshin@kookmin.ac.kr