# 우주탐사공학 학제전공

학과홈페이지: ae.kaist.ac.kr

학과사무실: 042-370-3706

## ▣ Introduction

The primary goal of Space Exploration Engineering(SPE)) program is to develop highly skilled manpower for future national space program through multi-disciplinary education program. Furthermore, we look forward to expanding technological basis in spacecraft and space exploration accumulated by KAIST to international level. For such challenging objectives, our program seeks to train spacecraft experts with mission design analysis capability and system integration knowledge. Moreover, the experts should develop themselves with independent R&D activity and international co-research work through SPE program.

Space has vast scientific, military, economical, social values in its exploration, and nowdays it is considered immense human resources. Our neighboring and leading countries are establishing own space programs and take aggressive actions in developing space technologies. Our government is planning on vision for future national space program with technology infrastructure in Earth observation and scientific satellites developed last 15 years. In 2007, our government announced road map for lunar exploration; launching the first lunar mission satellite in 2020, and lunar lander in 2025. It is required to build skillful technical man power and investigate core technologies by establishing systematic educational and training system.

Space exploration requires multi-disciplinary technologies such as electrical engineering, electronics, computer science, aerospace, mechanical engineering, material science, physics, astrodynamics. KAIST is a leading academic institute, represented Wooribyul satellites, in space technology in Korea. The Space Exploration Engineering Program will be led by faculty members from the departments of electrical engineering, aerospace engineering, physics, mechanical engineering. Technical staffs at Satellite Research Center(SaTRec) will be involved with education and training. Advanced knowledge and hand-on experience will be provided to the students. Key research areas include mission design/analysis, spacecraft engineering, payload technologies, space robotics. The research areas will be decided to meet the concurrent need of national space program. Furthermore, students will be given opportunities to actively participate in future space exploration subjects. In order to experience system engineering, students will make a team to build their own nano-scale satellite.

Space Exploration Engineering Program is aiming the goal to develop into a world-class education and research group in the next ten years. For this goal, building independent research capability and participating national space program are planned with internal network. Students and faculty members with diverse background will work on advanced research on space exploration and contribute to national space program.

## ▣ Research Activity

The Space Exploration Engineering Program has four major education and research areas.

○ Space Exploration Mission Design

The primary goal of this area is mission design for space exploration. It is essential to design space missions with success for the spacecraft to reach moon or solar system. For this goal, technological elements such as optimal mission design, guidance and control, autonomy, and fault diagnosis of spacecraft. Docking technology for robotics on the planet surface and reentry technology to deliver samples collected on the planet to the earth are included. The mission design area essentially covers technologies for guarantee of mission success.

○ Core Spacecraft Technology Engineering

The main objective is to study core technologies on spacecraft design. In general, spacecraft requires high reliability light-weight structure and propulsion systems during flight or landing stage. Also, high reliability onboard computer, large high speen memory, deep space communication system hardware and algorithm will be investigated. For long-duration mission, efficient power system is another key element. For space flight and attitude control, highly efficient main and auxiliary thruster systems technology will be studied. In order to survive in space environment, light-weight composite material and associated structural sub-systems design will be investigated in this Core Spacecraft Technology Engineering area.

○ Mission Payload and Image Processing Research

The primary goal of this area is to conduct advanced research on space payloads and data processing technology. For lunar and solar system exploration, payload design to meet the mission objectives is required. The recent trend of space exploration is more focused on detecting resources rather than purely scientific purpose. In order to keep pace with such trends, space robotics, micro-wave and optical payload technologies are main research subjects. Unlike conventional Earth-mission spacecraft, new technology paradigms such as miniaturization, low-power, and light-weight are will be investigated in this field.

○ Space Robotics Research

Research on core-technologies for space robotics which will land on lunar surface to perform missions is primary goal of this field. One of the reason why lunar exploration mission has received intense focus recently among may nations is because of natural resources on the moon. The space robotics research is target to searching natural resources on lunar surface or other planets. Mars exploration robotics is another potential area being considered. Considering space environment which is different from the Earth environment in many ways, key technologies will be investigated which include communication, control, mechanism, remote control under communication time delay, information analysis, and sensor network. In particular, obstacle avoidance on lunar surface efficient mechanism design, and deepspace communication will be the focus of research subjects.