2.2. Department of Aeronautical Science and Flight Operation

■ General Information

The department is based on science, endowing students with the ability of logical analysis for flight operations and has the educational goals of training pilots to be qualified with the principles of flight operations and procedures, facilities, equipment, flight environment and safety, and the ability to conduct research for the training and qualification management of pilots.

■ Objectives

1) To endow the students with the ability for logical analysis by instructing students on the atmospheric environment related to flight operations inside and outside of the troposphere.
2) To educate students to have a thorough understanding of flight principles and procedures based on scientific technology.
3) To endow the students with the ability to make continuous efforts to better understand a wide range of topics including facilities, equipment, and personnel management related to flight operations in the graduate school.
4) To practice flying techniques to obtain a private license with an instrument rating or a commercial license with an instrument rating before graduation.

■ Facilities

Cessna C-l72R

The Cessna 172R is a typical single engine, high wing airplane suitable for basic pilot training produced by the Cessna Aircraft Company. This famous model has positive stability, required safety and maneuverability. The horsepower rating and engine speed of a Cessna 172R is 160 rated BHP at 2400rpm, and it is equipped with sophisticated instruments and devices as well as GPS, dual navigation (NAV) and communication (COMM) equipment. Six C-172Rs are used for a Private Pilot License (PPL) course and basic instrument training at KAU.

Mooney M2OJ

The M2OJ's airframe is solidly constructed to deliver startling performance. This body with a quiet cabin and the ample room for four persons provides an average useful load of 1,000 pounds. The M2OJ cruises at 174 knots on less than 15 gallons per hour (GPH). The horsepower rating and engine speed of an M2OJ is 200 rated BHP at 2400rpm. The M2OJs at KAU are equipped with dual NAV and COMM systems, HSI, RMI and GPS. Six M20Js are used for a PPL course, a CPL course and an instrument pilot rating (IR) course.

Airport (R-113 ; Susaek)

Susaek Airport is located on the KAU campus. The airport has a runway (1,320×18 meters), a taxiway (952×15 meters), a control tower, a flight operations office, a PAPI, and approach lights.

Navigation Planning Room
(Room 203, Science Hall)
Before actual cross-country flying, students are required to practice basic navigation planning methods to improve students' planning capabilities. Also weather information, aeronautical information, aeronautical charts and NOTAMs are provided and explained in detail in order to facilitate proper flight planning. Plotting devices, DR computers and reference data are also available in this room.

Briefing Room
(Room 204, Science Hall)
Pre and post briefings for flights are made in this area. Instructors provide detailed descriptions of training subjects and practical methods. Audio and visual aids may be used for efficient instruction in this room.

ATC Communication Lab.
(Room 235, Science Hall)
For better communication between pilots and controllers or pilots with one another, students are instructed in aviation English in this room. Full audio and video systems are equipped in this lab, and audio and video materials are provided for the students to practice with.

Flight Simulator Laboratory
(Room 106, Science Hall)
The flight simulator lab has been established for the purpose of training students on basic instrument flight and instrument approach procedures. Frasca 142 flight simulators are used to provide comprehensive training. The flight simulator lab gives students practical capabilities to deal with IFR weather and emergency conditions.

Applied Aerodynamics Laboratory
(Room 107, Aviation Technology Building)
KAU is committed to conducting research on aerodynamic characteristics, flow structures and the analysis of fluids over bodies in order to apply and offer the design parameters of vehicles or machinery. Research is further facilitated by using measurement equipment such as hot-wire anemometry and pressure transducers, force balance and visualization apparatuses. In particular, KAU is focusing on the unsteady aerodynamics at a low Reynolds number and performing research on oscillating airfoils, flow control, ornithopters and biomimetic micro air vehicles (MAVs).

Flight Training Center
The Flight Training Center (FTC)is officially endorsed as a technical educational institution

for pilot training courses by the Ministry of Land, Transport and Maritime Affairs in accordance with the provisions of Aviation Law. It consists of a flight education department, an aircraft maintenance department, and a flight information office. The FTC also takes charge of special flight training for university students, government trustees, and all personnel coming from aviation-related agencies in order to provide them with opportunities for obtaining pilot licenses.

■ Courses Offered

Required Courses

FO3108 Municipal Aviation Law 3(3) 1-2
FO3201 Aircraft Reciprocating Engines 3(3) 2-1
FO3206 Aeronautical Meteorology Ⅰ 3(3) 2-1
FO3213 Aviation Practical English Ⅰ 2(2) 2-1
FO3215 Jet Aircraft Performance 3(3) 2-2
FO3211 Aerodynamics 3(3) 2-2
FO3214 Aviation Practical English Ⅱ 2(2) 3-2
FO3350 Air Navigation 3(3) 3-1
FO3305 Air Traffic Management Ⅰ 3(3) 3-1
FO3306 Theory of Instrument Flying Ⅰ 3(3) 3-2
FO3315 Aeronautical Information Manual Ⅰ 3(3) 4-1

Elective Courses

FO3150 Statics 3(3) 1-1
FO4103 International Aviation Law 3(3) 1-1
FO4105 Introduction to Aviation Industry 2(2) 1-1
FO4120 Electronic Engineering 3(3) 1-2
FO4122 Dynamics 3(3) 1-2
FO4104 Special Physical Culture Ⅰ 2(2) 1-2
FO4106 Physiology of Flight 2(2) 1-2
FO5006 Aviation Instruction & Training 3(3) 1-2
FO4209 English Conversation 2(1) 1-2
FO4402 Human Factors in Aviation Safety 3(3) 1-2
FO4205 Thermodynamics 3(3) 2-1
FO4207 Special Physical Culture Ⅱ 2(2) 2-1
FO4213 Transportation Noise Engineering 3(3) 2-1
FO4397 Aircraft Systems 3(3) 2-1
FO4240 Flight Theory 3(3) 2-2
FO4241 Aeronautical Meteorology Ⅱ 3(3) 2-2
FO4202 Flight Safety 3(3) 2-2
FO4204 Aircraft Operating Manuals 3(3) 2-2

FO3250 Aviation Data Processing & Simulation 4(2) 2-2
FO4212 Fluid Mechanics 3(3) 2-2
FO4243 Airport Engineering 3(3) 2-2
FO4214 Special Physical CultureⅢ 2(2) 2-2
FO4216 Search & Rescue 2(1) 2-2
FO4244 Space Flight & Tour 3(3) 2-2
FO4391 Flight Training Ⅰ 3(2) 3-1
FO4393 Flight Operation Ⅰ 16(2) 3-1
FO4387 Crew Resource Management 3(3) 3-1
FO4301 Aircraft Structures 3(3) 3-1
FO4309 Air Navigation Aids 3(3) 3-1
FO4398 Transportation Environment 3(3) 3-1
FO4390 High Speed Aerodynamics 3(3) 3-1
FO4399 Management of Aviation Security 3(3) 3-1
FO4388 Aviation English Ⅰ 3(2) 3-1
FO4392 Flight Training Ⅱ 3(2) 3-2
FO4394 Flight Operation Ⅱ 16(2) 3-2
FO4385 Theory of Instrument Flying Ⅱ 3(3) 3-2
FO4386 Air Traffic Management Ⅱ 3(3) 3-2
FO4382 Communications, Navigation and Surveliance/Air Traffic Management 3(3) 3-2
FO4380 Avionics Systems 3(3) 3-2
FO4384 Air Space Planning 3(3) 3-2
FO4383 Aircraft Accident Investigation 3(3) 3-2
FO4389 Advanced Computer Programing 3(2) 3-2
FO4395 Communication Skills 3(3) 3-2
FO4396 FAR(Federal Aviation Regulation) 3(3) 3-2
FO4403 Flight TrainingⅢ 16(4) 4-1
FO4405 Flight OperationⅢ 16(5) 4-1
FO4407 Synthetic Instrument Flight Ⅰ 2(1) 4-1
FO4493 Aeronautical Information Manual Ⅱ 3(3) 4-1
FO4491 Aviation Weather Service(FAA) 3(3) 4-1
FO4414 Flight Management System 3(3) 4-1
FO4492 Safe Management System 3(3) 4-1
FO4408 Flight TrainingⅣ 16(4) 4-2
FO4404 Flight OperationⅣ 16(5) 4-2
FO4490 Overseas Flight Operation 40(12) 4-2
FO4410 Synthetic Instrument Flight Ⅱ 2(1) 4-2

AABI- Aviation Studies (Aeronautical Science and Flight Operations)

AABI in the department of aeronautical science & flight operations is referred to as the Flight Education Program (Aeronautical Science & Flight Operations). The aim of the program is to foster excellence in pilots and flight operators for the international aerospace industry in the 21st Century. The Flight Education Program is designed to enhance both flight training courses including aeronautical navigation and flight instruments as well as basic studies such as the principles of flight, flight procedures, aviation safety, human factors, CRM, aviation meteorology, aeronautical dynamics and aviation laws based on the physical environment, and scientific flight operations and related phenomenon.

Curriculum Plan

* All courses are required for students who enroll in AABI-Flight Education(Aeronautical Science & Flight Operations)

Year	Semester	Course	Title	Credits
Freshmen	Spring	FO4103	International Aviation Law (C)	3
		RC7103	Calculus (C, G)	3
		GS1107	Introduction to Aeronautics (C)	3
	Fall	RC7105	Physics and Experiments Ⅰ(G)	3
		FO5006	Aviation Instruction & Training (O)	3
		FO3203	Municipal Aviation Law (B)	3
Sophomore	Spring	FO3201	Aircraft Reciprocation Engines (B, C)	3
		FO3211	Aeronautical Meteorology I (B, C)	3
	Fall	FO3215	Jet Aircraft Performance	3
		FO3206	Aerodynamics (B)	2
		FO4202	Flight Safety (C)	3
		FO4204	Aircraft Operation Manuals (O)	3
		FO3301	Aeronautical Meteorology Ⅱ (B, O)	3
Junior	Spring	FO3306	Theory of Instrument Flying I (B, O)	3
		FO3350	Air Navigation (B, O)	3
		FO5003	Aviation Practical English Ⅰ (G)	2
		FO3305	Air Traffic Management I (B, C)	3
		FO3252	Crew Resource Management (O)	2
		FO4303	Flight Training Ⅰ (O)	2
		FO4305	Flight Operation Ⅰ(O)	2
	Fall	FO5005	Aeronautical Information Manual I (B, C)	3
		FO3306	Theory of Instrument Flying II (B, O)	3
		FO4379	Flight TrainingⅡ (O)	2
		FO4306	Flight OperationⅡ (O)	2
Senior	Spring	FO5009	Aeronautical Information Manual Ⅱ (B, C)	3
		FO4403	Flight TrainingⅢ (O)	4
		FO4405	Flight OperationⅢ (O)	5
		FO4407	Synthetic Information Manual Ⅰ (O)	1
	Fall	FO4408	Flight TrainingⅣ (O)	4
		FO4490	Overseas Flight Operation (O)	12

***B (Basic Required Course/AABI) / C (Aviation Core/AABI)**
G (General Education/AABI) / O (Option in Flight Education)

■ Course Descriptions

FO3108 **Municipal Aviation Law 3(3)**
This course teaches comprehensive knowledge of domestic aviation law for A/C operations as well as provisions for other countries.

FO3201 **Aircraft Reciprocating Engines 3(3)**
This course teaches basic theories of thermodynamics and cycles including internal combustion engines, mechanical relationships of components, construction, power calculations and other systems.

FO____ **Aviation Meteorology Ⅰ, Ⅱ 3(3)**
These courses teach the basic concepts and processes of atmospheric phenomena and their relation to aeronautical factors.

FO3213/3214 **Aviation Practical English Ⅰ, Ⅱ 3(3)**
These courses provide a thorough background in technical aviation terms, flight theories and aircraft operations.

FO3215 **Jet Aircraft Performance 3(3)**
This course teaches basic theories of thermodynamics and operation principles of gas turbine engines. It also covers the performance of gas turbine engines including diffusers, compressors, combustion, turbines and nozzles.

FO3211 **Aerodynamics 3(3)**
This course offers students a detailed examination of aerodynamics related to atmospheric flight, especially for pilots and workers in the aviation field, with emphasis on aircraft performance and operating considerations. The scope is extended to forces on aircraft, equations of motion, maneuvers, flight limitation, weight and balance, and longitudinal and lateral stabilities.

FO3350 **Air Navigation 3(3)**
This course teaches basic theories of pilotage, dead reckoning, radio navigation, astronavigation, and current issues regarding air navigation. The course also enables students to practice making flight plans using the skills of pilotage and dead reckoning covered during the semester.

FO3305/4386 **Air Traffic Management Ⅰ, Ⅱ 3(3)**
These courses teach basic air traffic control procedures and also discusses issues related to air traffic service and radio communication. Topics include flight abilities for safe inbound and outbound traffic.

FO3306 **Theory of Instrument Flying Ⅰ 3(3)**
These courses teach information related to aeromedical issues, including causes, symptoms, prevention and treatment of flight environment disorders related to instrument flying. It also deals with practical application for airport lighting, aircraft avionics and flying issues concerning the gyro horizon.

FO3315/4493 **Aeronautical Information Manual Ⅰ, Ⅱ 3(3)**
These courses teach how to gather flight information and how to use it correctly. It also covers air traffic procedures and all related flying procedures.

FO3150 **Statics 3(3)**
Statics discusses the knowledge of physical science which deals with the response of bodies at rest or at uniform motion to the action of forces. Emphasis is devoted to understanding engineering units, vectors, forces and moments, and the equilibrium of aircraft system at rest or at uniform motion.

FO4103 **International Aviation Law 3(3)**
This course teaches chronological development, international regulations, and the rights and liabilities of pilots and operators.

FO4105 **Introduction to Aviation Industry 2(2)**
This course teaches the general history and characteristics of the aircraft industry. It also discusses international aviation organizations and other management features of the air transport industry.

FO4120 **Electronic Engineering 3(3)**
This course teaches a basic knowledge of electronics with application to avionics.

FO4122 **Dynamics 3(3)**
This course deals with the motion of bodies under the action of forces to develop the capacity to predict the effects of force and motion. This lecture covers the kinematics and kinetics of particles, and the kinematics and kinetics of rigid bodies.

FO4104/4207/4214 **Special Physical Culture Ⅰ,Ⅱ, Ⅲ 2(2)**
This course offers training to establish the effective physical conditioning required for those who wish to work in the aviation field.

FO4106 **Physiology of Flight 2(2)**
This course teaches information related to aeromedical issues, including causes, symptoms, prevention and treatment of flight environment disorders.

FO5006 **Aviation Instruction & Training 3(3)**
This course teaches capabilities in taking care of human resources and the theories of efficient and effective pilot training programs.

FO4209 **English Conversation 3(3)**
This course aims to improve English speaking proficiency. Students will learn and practice English conversation skills from English native instructors.

FO4402 **Human Factors in Aviation Safety (3)**
This course teaches how to analyze different types of human factors that affect pilots directly and indirectly when operating the aircraft. The relationships between human factors and aircraft design, cockpit environment and operating the aircraft are focused on.

FO4205 **Thermodynamics 3(3)**
This course teaches the application of thermodynamic theory, and many other cycles related with thermodynamics.

FO4213 **Transportation Noise Engineering (3)**
This course deals with various sound wave characteristics, hearing and the psychological effects of noise and its effects on our environment.

FO4397 **Aircraft Systems 3(3)**
This course covers instruments and electrical systems for aircraft. Emphasis is devoted to understanding those systems and operations for normal and emergency situations as well as in-flight and post-flight troubleshooting from a pilot's perspective.

FO4240 **Flight Theory 3(3)**
This course deals with fundamental physical quantities, the basic equations of fluids, basic aerodynamics, airfoils and wings, and principles of stability and control to present the basic fundamentals of aeronautical science and flight operation.

FO4202 **Flight Safety 3(3)**
This course teaches major problem areas, program evaluation, the impact of accidents, and basic principles of investigation, as well as case surveys of accidents.

FO4204 **Aircraft Operation Manuals 3(3)**
This course deals with the important things students should know, such as the concepts of effective and safe flight, and the related rules and application of those rules.

FO3250 **Aviation Data Processing and Simulation 4(2)**
This course covers not only digital computer organization but also programming techniques on the basis of BASIC or FORTRAN languages.

FO4212 **Fluid Mechanics 3(3)**
This lecture covers fluid statics, similitude and dimensional analysis, fundamentals of fluid flow, and then flow of an incompressible ideal fluid.

FO4243 **Airport Engineering 3(3)**
This course covers managerial problems of airports, the designing of facilities, and other important matters related to the construction and maintenance of airports.

FO4216 **Search & Rescue 2(1)**
This course teaches how to cope with many emergencies through practical exercises when air emergencies or high risk situations happen.

FO4391/4392 **Flight Training Ⅰ, Ⅱ 3(2)**
These courses offer opportunities to practice take off and landing with real airplanes and teach how to navigate airplanes.

FO4393/4394 **Flight Operation Ⅰ, Ⅱ 16(2)**
These courses cover a variety of flight operation topics such as private pilot courses, flight theory and maneuvering, take offs and landings, air navigation and solo flights.

FO4387 **Crew Resource Management 3(3)**
This course teaches not only interpersonal skills for crew coordination, but also safety management techniques for threats, errors and undesired aircraft states on the basis of 6th CRM.

FO4301 **Aircraft Structure 3(3)**
This course teaches basic theories and analysis methods of aircraft structures, as well as the loads on the aircraft and the distribution of the loads through the individual members of the structures.

FO4309 **Air Navigation Aids (3)**
This course covers various ground or space-based navigation facilities, and their operational mechanisms and procedures. Emphasis is devoted to providing a full understanding of radios, radio navigation equipment and navigation techniques.

FO4398 **Transportation Environment 3(3)**
This course studies the effects of the transportation environment on aircraft, and vehicle operations.

FO____ **High Speed Flight Theory 3(3)**
This course deals with compressible fluid mechanics to present the basic fundamentals related with high speed airplanes. This lecture covers the concepts of compressible flow, governing equations for inviscid compressible flow, normal shock waves, oblique shock waves, expansion waves, and compressible nozzle flow.

FO4399 **Management of Aviation Security 3(3)**
This course covers the management of tasks for aviation security, the goals and

organization of civil aviation, the philosophy of aviation security, the nature of aviation threats, and techniques for security management. Emphasis is placed on leadership in security management, problem-solving, and decision making.

FO4388 **Aviation English Ⅰ,Ⅱ 3(3)**
This course teaches terms and expressions used in the aviation field and builds up listening, reading and speaking skills. The course also includes practice drills for executing effective communication during aircraft operations.

FO4385 **Theory of Instrument Flying Ⅱ 3(3)**
This course teaches the use of aircraft avionics and aeronautical information publications related to instrument flying. It also covers theory and practical application of navigation systems.

FO4382 **CNS/ATM(Communications, Navigation and Surveillance/Air Traffic Management) 3(3)**
This course is designed to provide concepts and principles of future navigation systems: satellite-based communication, navigation, surveillance and air traffic management systems.

FO4380 **Avionics Systems 3(3)**
This course covers the principles of auto piloting small and large aircraft, airborne Doppler radar systems, INS, and safety warning and recording systems.

FO4384 **Air Space Planning 3(3)**
This course teaches the methods of planning to utilize aerospace in a safe and efficient manner.

FO4383 **Aircraft Accident Investigation 3(3)**
This course covers the role of official investigators for a state or as accredited representatives of a manufacturer, operator or service provider. The main focus of the course is the civil aviation industry. The contents of the course normally deal with accident investigations connected with the rules, investigation techniques, aircraft technology, analysis, reports and investigation management.

FO4395 **Communication Skills 3(3)**
The core skills for CRM/TEM are communication skills. By exchanging information of situational awareness, this course helps students to develop their communication skills for rational decision making.

FO4396 **FAR(Federal Aviation Regulation) 3(3)**
A thorough study of the Federal Aviation Regulations helps students better enable themselves to manage their qualifications and acquire knowledge on operating procedures.

FO4403/4408 **Flight Training Ⅲ, Ⅳ 16(4)**
These courses offer opportunities to practice take-offs and landings and to navigate airplanes in real situations.

FO4405/4404 **Flight Operation Ⅲ, Ⅳ 16(5)**
These courses offer opportunities to practice take-offs and landings and to navigate airplanes in real situations.

FO4407/4410 **Synthetic Instrument Flight Ⅰ, Ⅱ 2(1)**
This course offers opportunities to practice on a simulation system repeatedly Students practice flight (synthetic instrument flight system, various flight conditions and weather, etc.) in a simulation system.

FO____ **Aviation Weather Service in U.S.A.(FAA) 3(3)**
By understanding the U.S. Aviation Weather Service, students will be able to easily adapt to overseas flight training. The course also encourages further awareness in aviation safety.

FO4414 **Flight Management System 3(3)**
This course teaches how to operate computers to build up managerial concepts of the latest airline industry operation systems.

FO4492 **Safe Management System 3(3)**
Safe Management System is recommended by ICAO, containing organization systems for safe management, as well as threat and error management. It leads students to become aviation safety managers.

FO4490 **Overseas Flight Operation 40(12)**
These courses offer opportunities to practice take-offs and landings and navigate airplanes in foreign countries in order to obtain foreign pilot licenses.