Jordan University of Science and Technology

Faculty of Engineering

Department of Aeronautical Engineering

Undergraduate Curriculum for the B.Sc. Degree in Aeronautical Engineering

2009

Vision

To be a premier institution for aeronautical engineering education and research.

Mission

To prepare engineers for success and leadership that is recognized internationally for its quality in the conception, design, implementation, and operation of aeronautical-related engineering systems.

Department Objectives

The educational objectives of the Aeronautical Engineering Program at JUST are to produce graduates who:

1. Engage in productive career in industry, military, academia, or research, enabled by their technical competence in aeronautical engineering,
2. Advance in responsibility and leadership in public, private, or military sectors in local and regional markets,
3. Demonstrate commitment to personal professional development as well as the sustainable development of the society,
4. Effectively communicate and function in various multidisciplinary environments and engage in life-long learning and professional development, and
5. Understand the ethical, cultural and environmental considerations of the engineering profession.

Learning Outcomes:

By the time of graduation, our graduates should be able to demonstrate the ability to:

a - Apply knowledge of mathematics, science, and engineering in practice.
b - Design and conduct experiments as well as analyze and interpret data.
c - Design systems, components, or processes to meet the desired needs.
d - Function within multidisciplinary teams.
e - Identify, formulate, and solve engineering problems.
f - Understand professional and ethical responsibilities of aeronautical engineers.
g - Communicate effectively.
h - Obtain broad knowledge to understand the implications of engineering solutions within global and societal contexts.
i - Recognize the need for, and possess the ability to engage in, lifelong learning.
j - Possess knowledge of contemporary issues.
k - Use the techniques, skills, and modern engineering tools necessary for engineering practice.

AE Undergraduate Curriculum

Course Coding (Numbering)

A two letters (or three letters, if necessary) and three 3-numbers code is given to each course offered by the dept. as shown below:

Department			Level/Year	Field	Sequence
A	B	C	X	Y	Z

The Department codes (A, B, C) are selected as follows:

Code	Department
AE	**Aeronautical Engineering**
CE	Civil Engineering
ME	Mechanical Engineering
EE	Electrical Engineering

Code	Department
IE	Industrial Engineering
ChE	Chemical Engineering
BME	Biomedical Engineering
NE	Nuclear Engineering

Therefore, courses in Aeronautical Engineering will have numbers of the form **AE** XYZ, where the coding of X, Y and Z is described as follows:

A- The middle digit (Y) denotes the course subject area as follows:

Number	Field
0	General/Miscellaneous
1	General Mechanics (Dynamics & Strength of Materials)
2	Thermodynamics & Propulsion
3	Machine Design, Aircraft Structure &Materials
4	Fluid Mechanics, Gas Dynamics & Aerodynamics
5	Heat Transfer
6	Vibration, Stability & Control
7	Engineering Measurements & Aircraft Sensors
8	Aircraft Performance & Maintenance
9	Projects, Special Topics & Training

B- The leftmost digit (X) denotes the level of the course according to student's study plan as follows:

Number	Level of Course
1	First year
2	Second year
3	Third year
4	Fourth year
5	Fifth year.

C- The rightmost digit (Z) denotes the course sequence in its subject area (Odd numbers represent first semester and even numbers represent second semester courses).

Example:

AE 511			
AE	5	1	1
Department	5th year level	General Mechanics field	1st semester sequence / offering

Framework for AE B.Sc. Degree (159 Semester Credits)

The Bachelor of Science (B.Sc.) degree in Aeronautical Engineering in the Faculty of Engineering at JUST is awarded in accordance with the Statute stated in the JUST regulations for B.Sc. awarding issued by the Deans' council based on the 1987 law for awarding scientific degrees and certifications at JUST and after the successful completion of 159 credit hours (C.H). The 159 C.H are distributed as shown in Tables (1).

Table 1: Distribution of credit hours

Classification	Credit Hours		
	Compulsory	Elective	Total
University Requirements	16	9	25
College Requirements	32	-	32
Department Requirements	93	9	102
Total =	**141**	**18**	**159**

Degree Requirements

University Requirements (25 Credit Hours)

Students are required to study a total of 25 credit hours (16 compulsory and 9 electives), as follows:

a- Compulsory: (16 Credit Hours)

Table 2: University compulsory courses (16 credit hours)

Course No.	Course Title	Cr. Hr.	Lecture	Lab.	Prerequisite or Corequisite
Arb 101	Arabic Language	3	3	0	
HSS 100	Culture and University Behavior	1	0	0	
Eng 111 (1)	English Language I	3	3	0	Pass Eng 099 or acquiring ≥ 50% in the English language level exam.
Eng 112	English Language II	3	3	0	Eng 111 or acquiring ≥ 80% in the English language level exam.
CIS 100 (2)	Computer Skills	3	3	0	
MS 100 (3)	Military Science	3	3	0	
	Total	**16**			

(1) Students who obtain less than 50% in the English language level test must study the following course: Eng 099; preparatory English language (3 credit hours). However, students who obtain 80% or more in the English language level are exempted from studying this course. Those who obtain 500 or more in the TOEFL test are also exempt from studying Eng. 111.

(2) A student who passes the Computer Skills Placement Test with a grade > 50% is exempted from CIS 100.

(3) This course is required from Jordanian students only; graded on Pass/Fail basis. Students graduating from Royal Military faculty and military candidates' school and equivalent institutes are exempted from taking this course: Non-Jordanian students are required to take a substitute for this course from the elective courses and in this case the grade of this course is included in his grade point average (GPA)

Notice: All the non Arabic Speaking foreign students in the University are required to study one course in Arabic language as shown in Table (3):

Table 3: Courses for non Arabic Speaking Students

Course Code & No.	Course Name	Credit Hrs
Arb 101A	Fundamentals of Arabic Language (for non Arabic speaking students as a substitute for the course Arb101 Arabic Language)	3

b- University Elective: (9 Credit Hours)

A total of 9 credit hours should be selected from the list of elective courses listed in the table (4).

Table 4: University elective courses

Course No.	Course title	Cr. Hr.	Lecture	Lab	Prerequisite or Corequisit
ES 103	Environment Protection (for non Environment sciences students)	3	3	0	
PH 200	First Aid and Emergency Procedure (for non Medicine, non pharmacy, non Nursing, and non Midwifery students)	3	3	0	
PH 104	Community Health and Nutrition (for non Medicine, non Nursing, and non Midwifery students)	3	3	0	
PHAR 104	Drugs and Medical Plants in Jordan (for non Medicine, and non Pharmacy students)	3	3	0	
NUR 100	Health Promotion (for non Medicine, non Nursing, and non Midwifery students)	3	3	0	
ADS 100	Oral and Dental Health (for non Dentistry and non Applied Dental Sciences students)	3	3	0	
PP 200	Home Gardens (for non Agriculture students)	3	3	0	
PP 201	Bees Keeping (for non Agriculture students)	3	3	0	
VM 211	Animal Health (for non Veterinary Medicine and non Agriculture students)	3	3	0	
VM 212	Pet Animal Care (for non Veterinary Medicine students)	3	3	0	
HSS 112	Hadith Shareef	3	3	0	
HSS 113	Aqideh	3	3	0	
HS 114	Fekeh	3	3	0	
HSS 115	Islam and Recent Problems	3	3	0	
HSS 116	Islamic Economy System	3	3	0	
HSS 121	Principles of Sociology (for non English Language students)	3	3	0	
HSS 126	Principles of Psychology (for non Nursing, and non Midwifery students)	3	3	0	
HSS 127	Educational Technology	3	3	0	
HSS 128	National Education	3	3	0	
HSS 131	Islamic Civilization	3	3	0	
HSS 132	The History of the City of Jerusalem	3	3	0	
HSS 133	Civilization and Recent Cultures	3	3	0	
HSS 141	Introduction to Economics (for non CIS students)	3	3	0	
HSS 142	Library and Information Research	3	3	0	
HSS 151	Introduction to Management Sciences (for non CIS students)	3	3	0	
HSS 161	Contemporary Problems	3	3	0	
HSS 166	Man and Science	3	3	0	
HSS 182	Studies on Women	3	3	0	
HSS 250	Music History (in English)	3	3	0	
HSS 211	Introduction to Sociology (in English)	3	3	0	
HSS 212	Arab Society (in English)	3	3	0	
HSS 213	Individual and Society (in English)	3	3	0	
HSS 216	International Global Issues (in English)	3	3	0	
HSS 221	Introduction to Psychology (in English)	3	3	0	
HSS 222	Creativity and Problems Solving	3	3	0	

HSS 224	Leadership and Communication Skills	3	3	0	
HSS 241	Economy in the Third World	3	3	0	
HSS 242	Information and Research (in English)	3	3	0	
HSS 429	Behavioral Science and Dealing with Children	3	3	0	
PT 100	Health and Life Styles (for non physical therapy and occupational therapy students)	3	3	0	
ME 211	Fundamentals of Automobile Engineering (for non ME students)	3	3	0	
NR 200	Natural Resources and Human Being (not for Agriculture students)	3	3	0	
NF 177	Food Preservation (for not Nutrition and Food Technology)(in English)	3	3	0	
HSS 231	History of Science in Islam	3	3	0	
AP 200	Farm Animal Products and Production (not for Agriculture or Veterinary Medicine students)	3	3	0	

Faculty Requirements: (32 Credit Hours)

The faculty course requirements include a total of 32 credit hours, as shown in table (5)

Table 5: Faculty of Engineering requirements

Course No.	Course Title	Cr. hr.	Lecture	Lab.	Prerequisite or Corequisite
Math 101	Calculus I	3	3	0	None
Math 102	Calculus II	3	3	0	Math 101
Math 201	Intermediate Analysis	3	3	0	Math 102
Math 203	Ordinary Differential Equations I	3	3	0	Math 102
Phys 101	General Physics I	3	3	0	None
Phys 102	General Physics II	3	3	0	Phys 101
Phys 107	General Physics Lab	1	0	3	Pre/Co Phys 102
Chem 101	General Chemistry I	3	3	0	None
Chem 102	General Chemistry II	3	3	0	Chem 101
Chem 107	General Chemistry Lab	1	0	3	Pre/Co Chem 102
CS 115	Programming in C++ Language	3	3	0	CIS 100
EE 202	Communication Skills for Engineers	2	2	0	2nd Year Standing
ChE 400	Professional Ethics for Engineers	1	1	0	Passed 90 Credits
	Total	**32**			

Department Requirements: (102 Credit Hours)

The course requirements include a total of 102 credit hours divided into two groups,

a) Compulsory Department courses: Students have to take 93 credit hours from table (6) as shown in table 6:

Table 6: Department compulsory courses (93 credit hours)

Course Number	Course Name	**Cr. hr.**	**Lecture**	**Lab.**	**Prerequisite or Corequisite**
ME 101	Engineering Workshop	2	1	3	
ME 101	Engineering Workshop Lab	0	0	0	
CE 201	Statics	3	3	0	Phys 101
AE 203	Computer Aided Drawing (CAD)	2	0	6	CIS 100
ME 212	Dynamics	3	3	0	CE 201
ME 214	Strength of Materials	3	3	0	CE 201
EE 303	Fundamentals of Electrical Engineering (none EE students)	3	3	0	Phys 102
EE 305	Numerical Methods for Engineers	3	3	0	CS 115, ME 305
ME 305	Applied Math for Engineers	3	3	0	Math 201, Math 203
ME 311	Mechanics of Machinery	3	3	0	ME 212
ME 312	Mechanics of Materials Lab	1	0	3	ME 214, AE 331
AE 330	Machine Elements Design	3	3	0	ME 214
AE 331	Aircraft Structural Materials	3	3	0	ME 101, ME 214
CHE 340	Thermodynamics	3	3	0	Phys 101, Math 203
IE 341	Engineering Economics	2	2	0	Math 201
AE 342	Gas Dynamics	3	3	0	ME 343
ME 343	Fluid Mechanics	3	3	0	Math 203, Phys 101
AE 344	Aerodynamics I	3	3	0	ME 343
AE 422	Propulsion	3	3	0	AE 344
AE 433	Aircraft Structure I	3	3	0	ME 214
ME 445	Thermofluids Lab	1	0	3	Pre/Co. AE 451
AE 448	Aeronautics Lab I	1	0	3	AE 344
AE 451	Heat Transfer	3	3	0	ME 305, ME 343
ME 463	Mechanical Vibrations	3	3	0	ME 305, ME 212
AE 465	Automatic Control	3	3	0	Pre/Co. ME 463
AE 466	Aircraft Stability & control	3	3	0	AE 344, AE 465
ME 471	Instrumentation	3	3	0	ME 343, EE 303
ME 472	Instrumentation and Dynamic Systems Lab.	1	0	3	ME 471, ME 463
AE 482	Aircraft Performance	3	3	0	AE 344
AE 484	Aircraft Maintenance Systems	3	3	0	ME 305, AE 433
AE 490	Graduation Project I	1	-	-	Completion of 114 C.H.
AE 535	Aircraft Design	3	3	0	AE 466
AE 545	Computational Fluid Dynamics	3	3	0	ME 343, AE 451
AE 549	Aeronautics Lab II	1	0	3	AE 448
AE 591	Graduation Project II	3	-	-	AE 490
AE 592	Engineering Training	6	-	-	AE 591
	Total	93			

b) Technical electives: The technical electives include 9 credit hours. The student should study at least 6 credit hours of the technical electives listed in Table (7). The remaining 3 credit hours should be chosen either from Table (7) or any course of level (500) in the Engineering curriculum.

Table 7: Aeronautics Technical Electives

Course No.	Course Title	Cr. hr.	Lecture	Lab.	Prerequisite or Corequisite
AE 468	Rotary Wing Aircrafts	3	3	0	AE 344
AE 474	Aircraft Sensors and Actuators	3	3	0	ME 471
AE 506	MicroElectroMechanical Systems (MEMS)	3	3	0	AE 331, AE 451
AE 507	Finite Elements Methods in Aerospace Structures	3	3	0	ME 214, EE 305
AE 534	Aircraft Structures II	3	3	0	AE 433
AE 536	Aeroelasticity	3	3	0	AE 433, AE 344
AE 537	Composite Materials	3	3	0	AE 331, AE 433
AE 539	Fracture Mechanics	3	3	0	AE 433
AE 546	Aerodynamics II	3	3	0	AE 344
AE 547	Boundary Layer Theory	3	3	0	ME 343, AE 451
AE 576	Aircraft Navigation	3	3	0	AE 466
AE 593A	Special Topics in Aeronautics	3	3	0	Department approval
AE 593B	Special Topics in Aeronautics	2	2	0	Department approval
AE 593C	Special Topics in Aeronautics	1	1	0	Department approval

Study Plan for the B.Sc. Degree in Aeronautical Engineering

First Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
CIS 100	Computer Skills	3	-
Math 101	Calculus I	3	-
Phys 101	General Physics I	3	-
Chem 101	General Chemistry I	3	-
ME 101	Engineering Workshops	2	-
ME 101	Engineering Workshop Lab	0	-
Eng 111	English Language I	3	Pass Eng 99
Total		**17**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
Arb 101	Arabic Language	3	-
Phys 102	General Physics II	3	Phys 101
Chem 102	General Chemistry II	3	Chem 101
Math 102	Calculus II	3	Math 101
HSS 100	Culture and University Behavior	1	
Eng 112	English Language II	3	Eng 111
Chem 107	General Chemistry Lab	1	Pre/ Co. Chem 102
Total		**17**	

Second Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
MS 100	Military Science	3	
Phys 107	General Physics Lab	1	Pre/Co. Phys. 102
CS 115	Programming Language (C++)	3	CIS 100
EE 202	Communication Skills for Engineers	2	2nd year standing
Math 201	Intermediate Analysis	3	Math 102
CE 201	Statics	3	Phys 101
AE 203	Computer Aided Drawing (CAD)	2	CIS 100
Total		**17**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 214	Strength of Material	3	CE 201
IE 341	Engineering Economics	2	Math 201
Math 203	Ordinary Differential Equations I	3	Math 102
ME 212	Dynamics	3	CE 201
EE 303	Fundamentals of Electrical Engineering	3	Phys 102
	University Elective	3	
Total		**17**	

Third Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 305	Applied Math for Engineers	3	Math 201, Math 203
ME 311	Mechanics of Machinery	3	ME 212
ChE 340	Thermodynamics	3	Phys 101, Math 203
ME 343	Fluid Mechanics	3	Phys 101, Math 203
AE 331	Aircraft Structural Materials	3	ME 101, ME 214
	University Elective	3	
Total		**18**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
EE 305	Numerical Methods for Engineers	3	ME 305, CS 115
ME 312	Mechanics of Materials Lab	1	ME 214, AE 331
AE 342	Gas Dynamics	3	ME 343
AE 330	Machine Elements Design	3	ME 214
	University Elective	3	
AE 344	Aerodynamics I	3	ME 343
Total		**16**	

Fourth Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
AE 433	Aircraft Structure I	3	ME 214
AE 465	Automatic Control	3	Pre/Co. ME 463
ME 445	Thermofluid Lab	1	Pre/Co. AE 451
AE 451	Heat Transfer	3	ME 343, ME 305
ME 463	Mechanical Vibrations	3	ME 305, ME 212
ME 471	Instrumentation	3	ME 343, EE 303
ChE 400	Professional Ethics for Engineers	1	Passed 90 Credits
Total		**17**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
AE 466	Aircraft stability and Control	3	AE 344, AE 465
AE 422	Propulsion	3	AE 344
AE 490	Graduation Project I	1	Completion of 114 credit hours
AE 482	Aircraft Performance	3	AE 344
AE 484	Aircraft Maintenance Systems	3	ME 305, AE 433
	Technical Elective	3	
AE 448	Aeronautics Lab I	1	AE 344
Total		**17**	

Fifth Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
AE 591	Graduation Project II	3	AE 490
AE 535	Aircraft Design	3	AE 466
	Technical Elective	3	
	Technical Elective	3	
ME 472	Instrumentation and Dynamic Systems Lab.	1	ME 471, ME 463
AE 545	Computational Fluid Dynamics (CFD)	3	ME 343, AE 451
AE 549	Aeronautics Lab II	1	AE 448
Total		**17**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
AE 592	Engineering Training (one semester)	6	AE 591
Total		**6**	

Aeronautical Engineering Department Course Description

AE 203: Computer Aided Drawing (2CH)
Study of parametric solid modeling as a design/drawing tool using software such as ProEngineer. Topics include creation of three-dimensional solid models, assemblies, and renderings, as well as generation of two-dimensional technical drawings from three-dimensional models**.**
Pre: CIS 100

AE 330: Machine Elements Design (3CH)
The analysis of design of machine elements including fatigue-failure analysis of shafts, springs, screws, brakes, clutches, chains, belts, welds & rivets, lubrication of journals, ball & roller bearings, and spur, helical, bevel and worm gears.
Pre: ME 214

AE 331: Aircraft Structural Materials (3CH)
Imperfections in solids; Requirements from aerospace structural materials; Design philosophy (safe-life and damage-tolerant design); Aerospace applications of fracture mechanics; Airframe fatigue; Creep; Oxidation; Composite materials; Computer applications.
Pre: ME 101, ME 214

AE 342: Gas Dynamics (3CH)
One-dimensional gas dynamics; normal and oblique shock waves; Prandtl-Meyer flows; Rayleigh and Fanno-line flow; method of characteristics.
Pre: ME 343

AE 344: Aerodynamics I (3CH)
Basics of aerodynamics: the concept of lift and drag, stream function and potential velocity function. Incompressible-inviscid flow theory: flow about bodies, superposition of flows, source panel method, kutts-Joukwski theorem. Aerodynamic characteristics of airfoils: airfoil geometry parameters, vortex panel method, kutta condition, thin-airfoil theory, high-lift airfoil section. Wings of finite span: lifting-line theory, trailing vortices and downwash, vortex-induced drag, vortex-lattice method. Effects of boundary layer interaction.
Pre: ME 343

AE 422: Propulsion (3CH)
An integrated approach to the application of engineering principles to propulsion systems. Topics include: piston props, turboprops, turbojets, turbofans, turbo shaft, ramjets, scramjets and rocket engines, beside intakes, compressors, fans, combustors, turbines and propelling nozzles.
Pre: AE 344

AE 433: Aircraft Structure I (3CH)
Basics of elasticity. Bending, buckling, and Vibration of Euler-Bernoulli beam. Aerodynamic loads. Functions of structural components. Fabrication of structural components. Principles of stressed skin construction; bending, shear, and torsion of open and closed thin-walled, single and multi-cell, cross-section beams, including shear center and structural idealization.
Pre: ME 214

AE 448: Aeronautics Lab. I (1CH)
Basic measurements of aerodynamic forces and pressure distribution using low speed wind tunnel. Supersonic flow, flight demonstration, tunnel experiments. Aerospace propulsion (gasturbines), ramjets, etc.). Basic aircraft sensors.
Pre: AE 344

AE 451: Heat Transfer (3CH)
Principles of Heat Transfer. Steady state and transient conduction in different coordinates. Extended surfaces. Convective heat transfer. Analysis and empirical relations for forced and natural convection. Radiation heat transfer, radiation exchange between black and gray surfaces. Heat Exchangers. Thermal Stresses.
Pre: ME 305, ME 343

AE 465: Automatic Control (3CH)
Study of continuous-time systems, classical and modern system design methods, transfer function models, state space, dynamics of linear systems, and frequency domain analysis and design techniques. Introduction of controllability and observability, and full-state pole placement controller design.
Pre/Co. : ME 463

AE 466: Aircraft Stability and Control (3CH)
Introduction to stability and control of flight vehicles. Flight dynamic equations of unsteady motion. Inertial and aerodynamic coupling. Stability and control of longitudinal and lateral-directional motions. Dynamic stability and control.
Pre: AE 344, AE 465

AE 468: Rotary Wing Aircrafts (3CH)
Fundamentals of aerodynamics and fluid flow concepts for developing rotary wing aircraft performance. Two-dimensional aerodynamic characteristics of airfoils and their application in helicopter design. Means for augmenting lift and the effects of various types of high lift devices on the aerodynamic characteristics. Aerodynamics of finite aspect ratio wings leading to the fundamentals of airplane performance calculation. Theory of helicopter hovering and vertical flight including autorotation and the aerodynamic behavior of the rotor and helicopter in forward flight. Introduction to airplane and helicopter stability.
Pre: AE 344

AE 474: Aircraft Sensors & Actuators (3CH)
Study of control systems components and mathematical models. Amplifiers, DC servomotors, reaction mass actuators. Accelerometers, potentiometers, shaft encoders and resolvers, proximity sensors, force transducers, piezoceramic materials, gyroscopes, air-data systems, heading sensors, GPS receivers.
Pre: ME 471

AE 482: Aircraft Performance (3CH)
Aircraft performance in steady flight; Straight and level flight; Flight limitations; Drag; Power; Performance curves in terms of thrust and power; Gliding flight; Climbing flight; Range and endurance; Other methods of solution to performance problems; Aircraft performance in accelerated flight; Climbing flight; Take off; Landing; Turning flight; Introduction to helicopters; Helicopter performance; Thrust and torque theory; Rotor flow effects; Power required; Vertical climb.
Pre: AE 344

AE 484: Aircraft Maintenance Systems (3CH)
Introduction; Reliability theory; Life testing; Maintained systems; Integrated logistic support (ILS); Aircraft handling; Repair station requirements; Quality systems; Inventory control; Structural repair; Engine maintenance and overhaul; Maintenance of aircraft systems and instruments.
Pre: ME 305, AE 433

AE 490: Graduation Project I (1 CH)
Provides students the opportunity to individually explore an aeronautical engineering problem or issue within their field of study and apply their education to solving the problem for the benefit of the local community and society as a whole. Students produce a short report that documents the application of previous learning, experience and knowledge to the problem at hand, and evaluates the results.
Pre: Completion of 114 credit hours

AE 506: MicroElectroMechanical Systems (MEMS) (3CH)
Fabrication and design fundamentals for Microelectromechanical Systems (MEMS): on-chip sensor and actuator systems having micron-scale dimensions. Basic principles covered include microstructure fabrication, mechanics of silicon and thin-film materials, electrostatic force, capacitive motion detection, fluidic damping, piezoelectricity, piezoresistivity, and thermal micromechanics. Applications covered include pressure sensors, micromirror displays, accelerometers, and gas microsensors and microfluidic systems.
Pre: AE 331, AE 451

AE 507: Finite Elements Methods in Aerospace Structures (3CH)
Introduction to the advanced matrix methods in treating aerospace structures. Static analysis of wing, fuselage, and rocket structures. Stability and large displacement of ribs, stringers, and skins. Vibration of wing-fuselage combinations. Structural damping. Vibration of stretched or compressed wing panels.
Pre: ME 214, EE 305

AE 534: Aircraft Structures II (3CH)
Energy principles, matrix analysis of structures, introduction to finite element methods. Application to aircraft structural elements. Introduction to composite material in aircrafts and introduction to classical laminated plate theory. Elementary aerolasticity.
Pre: AE 433

AE 535: Aircraft Design (3CH)
Preliminary design of a modern airplane to satisfy a given set of requirements. Estimation of size, selection of configuration, weight and balance, and performance of airplane. Satisfaction of stability, control, and handling quality requirements.
Pre: AE 466

AE 536 : Aeroelasticity (3CH)
Wing divergence control reversal. Lift effectiveness. Swept wing aero elasticity. Vibrations of structure unsteady aerodynamic forces and moment. Flutter of a single degree of freedom system. Methods of flutter analysis.
Pre: AE 433, AE 344

AE 537: Composite Materials (3CH)
Introduction. Application of composite materials in aerospace industry.
Fiber reinforced composites. Stress, strain, and strength of composite laminate. Failure criterion. Environmental effect. Design of composite structure.
Pre: AE 331, AE 433

AE 539: Fracture Mechanics (3CH)
Investigation of linear elastic and elastic-plastic fracture mechanics. Topics include microstructural effects on fracture in metals, ceramics, polymers, thin films, biological materials and composites, toughening mechanisms, crack growth resistance and creep fracture. Also covered: interface fracture mechanics, fatigue damage and dislocation substructures in single crystals, stress- and strain-life approach to fatigue, fatigue crack growth models and mechanisms, variable amplitude fatigue, corrosion fatigue and case studies of fracture and fatigue in structural, bioimplant, and microelectronic components.
Pre: AE 433

AE 545: Computational Fluid Dynamics (3 CH)
Introduction to computational fluid dynamics and heat transfer using the finite-volume method. Extensive code development. Application of a commercial CFD solver to a problem of interest.
Pre: ME 343, AE 451

AE 546: Aerodynamics II (3CH)
Dynamics of a compressible flow field, Prandtl-Meyer flow, Mach lines and characteristics, Linearized compressible subosonic flow: flow about a thin wing, swept wings at transonic speed Two-dimensional, supersonic flows over wings and airplane configuration: conical-flow method, singularity-distribution method . High-lift configurations: multielement airfoils, Drag reduction methods: laminar-flow control. Aerodynamics design tools.
Pre: AE 344

AE 547: Boundary Layer Theory
Derivation of the boundary layer equations. Exact, approximate, and numerical solution techniques. Boundary layers in compressible flow. Separation. Unsteady boundary layers. Stability and transition. Turbulent boundary layers. Integral, differential, & numerical methods for solving problems associated with transfer of heat in a viscous fluid.
Pre: ME 343, AE 451

AE 549: Aeronautics Lab. II (1CH)
Short period oscillation; The phugoid oscillation; Trim curves and neutral point determination; Bending of Aircraft Wing (Symmetric Wing; The Role of the Shear Center); Torsion of Airfoils (Two-cell Section; Effect of the Spar); Thin-walled Shear Beams (Three Stringer Beams; The Role of the Shear Center); Structural Dynamics (Vibration of Beam; Various Vibration Modes of a Cantilevered Plate); Whole-field Stress Analysis (Photoelasticity of Grooved Specimen; Effect of Notch Geometry).
Pre: AE 448

AE 576: Aircraft Navigation (3CH)
Fundamentals of aircraft navigation systems. Techniques in celestial and inertial navigation. Global Positioning System (GPS) principles. Least squares estimation and Kalman filtering for optimal estimation of stochastic systems.
Pre: AE 466

AE 591: Graduation Project II (3CH)
Students perform the experimental and/or practical phases associated with solving the aeronautical engineering problem addressed in Graduation Capstone Project I. Students produce a full technical report that documents the research, design, results, analysis, and recommendations of the study, followed by a final presentation and defense.
Pre: AE 490

AE 592: Engineering Training (6 CH)
One academic semester (16 weeks) of practical training in an institution (university, company, …etc) that is accredited by the aeronautical engineering department and faculty of engineering at JUST for training purposes in the field of aeronautical engineering. The training should be under the supervision of a staff member. Students have to submit a report about his achievements during training in addition to any other requirements assigned by the department. By the end of the training period, the student should be capable to apply for the Airframe and Power (A&P) certificate.
Pre: AE 591

AE 593A: Special Topics in Aeronautics (3CH)
Pre: Department approval

AE 593B: Special Topics in Aeronautics (2CH)
Pre: Department approval

AE 593C: Special Topics in Aeronautics (1CH)
Pre: Department approval