DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

UNDERGRADUATE COURSES

F426100 Introduction to Aeronautics and Astronautics (1, -)

F410100 Engineering Graphics (1, -)

F411200 Energy Technology (1, -)

3-105
F420800 Introduction to Computer (-, 2)


F420310 Thermodynamics I (3, -)


F420320 Thermodynamics II (-, 3)

F421010 Engineering Mechanics I (-, 2)

F421020 Engineering Mechanics II (3, -)

F420500 Mechanical Engineering Drawing (-, 1)
   1) Dimensioning; 2) Tolerancing and Surface Qualify; 3) Mechanical Fasteners: Bolts, Nuts, Screws, Keys, Springs & Washers; 4) Permanent Fasteners: Welding & Riveting; 5) Preparation of Production Drawing; 6) Basic Idea of Computers in Engineering & Graphics. (Prof. Wei-Hsiang Lai)

F420710-20 Engineering Mathematics I-II (3,3)
Transforms; 6) Linear Algebra; 7) Vector Calculus; 8) Fourier Series.
(II): 1) Partial Differential Equations; 2) Complex Functions; 3)
Power Series, Taylor Series, Laurent Series; 4) Residue Integration
Method; 5) Conformal Mapping; 6) Complex Analysis Applied to
Potential Theory; 7) Numerical Methods; 8) Optimization; 9)
Probability and Statistics. (C.M. Lee, Prof. San-Yih Lin)

F420800 Electric Circuits and Electronics (3,-)

1) Circuit theory: The concepts and the basic elements of an
electric circuit, Steady state analysis of the direct current (DC)
networks, Steady state analysis of the alternating current (AC)
networks, Other related topics; 2) Electronics: Semiconductor and
the physics of the semiconductor, Diode and diode circuit analysis,
Bi-polar transistor (BJT) and the BJT circuits, Filed effect transistor
(FET) and the EFT circuit. (Profs. Jenq-Tzong H. Chan, S.M. Ding)

F430200 Engineering Materials Science (3,)

1) Introduction; 2) Crystal Structure of Metals; 3) Mechanical
Properties of Metals; 4) Dislocations and Strengthening Mechanisms;
5) Failure; 6) Phase Diagrams and Alloys; 7) Composites. (Profs.
Wen-Bin Young, Syh-Tsang Jeng)

F425900 Mechanics of Materials (-,3)

1) Tension, Compression and Shear; 2) Axially Loaded Members;
3) Torsion; 4) Shear Force and Bending Moment; 5) Stresses in
Beams; 6) Analysis of Stress and Strain; 7) Deflections of Beams; 8)
Statically Indeterminate Beams; 9) Columns. (Profs. Lee-Jen Lee,
Le-Chung Shiau)
F428000 Fluid Mechanics (-,3)  

F420600 Aircraft Engines (3,-)  

F430310-20 Aerodynamics I-II (3,3)  
Compressible Flow; 9) Concluding Remarks.


F431700 Introduction to Control Systems (3,-)

F430410-20 Aircraft Structure I-II (3,2)

F431600 Structure and Material Laboratory (1,-)
1) Orientation; 2) Strain Gages: Multimeter, Wheatstone Bridge; 3) Investigation of Stress-Strain Relationships Using Strain Rosettes; 4) Stress-Strain Behavior of Metals in Tension; 5) Torsion Tests of Aluminum, Steel and Cast Iron; 6) Pure Bending and Combined Bending and Shear in an Aluminum Beam; 7) Test of Solid Column; 8) Stress Wave in a Solid Bar. (Prof. Lee-Jen Lee)

F431500 Guidance and Control Laboratory (-,1)
1) Analog Simulation; 2) System Sensitivity Analysis; 3) Analog Controller (Phase-lead/lag) Design; 4) DC Servo Motor Control; 5) DC Servo Motor Control (State Feedback); 6) Time-Delay System Control; 7) Temperature Measurement and Control; 8) Pneumatic Servo System Control; 9) Pressure Regulating; 10) Non-linear System Control. (Drs. Jenq-Tzong H. Chan, Chieh-Li Chen)

F440200 Flight Mechanics (-,3)
F441200 Heat Transfer (3,-)

F421000 Thermo-Fluid Laboratory (1,-)

F440410-20 Aircraft Design (2,2)

(II): 1) Preliminary Sizing of the Vertical and Horizontal Tails; 2) Transonic and Supersonic Wing-Body Drag (Ares Ruling); 3)

**F411300 Aircraft System and Maintenance (-,3)**


**F421200 Digital Electronics (3,-)**

Network Design; 10) SPICE Simulation.

**F425800 Mechanism (3,-)**


**F430900 C Programming Language and the Basic Computer Interface (3,-)**


**F431200 Computer Aided Engineering Drawing (3,-)**

1) Basic concepts in engineering drawing; 2) How to use Chinese National Standard; 3) AutoCAD R12 software - a) Introduction of AutoCAD software; b) AutoCAD R12 getting start and interface; c) Entities draw commands; d) Edit and Inquiry commands; e) Display control; f) Entities properties; g) Dimensioning and Drawing aids; f) Crosshatching and Pattern filling; 4) AutoCAD R12 practice - a) PC and interfaces, operation; b) Topics are designed to follow course contents. (Prof. Wei-Hsiang Lai)
F421100 3-D Modeling Design and Rapid Prototyping (-,3)
1) Introduction to Engineering Design; 2) Planning of Design Process; 3) Embodiment Design-Design for a Special Purpose; 4) Design Tool-Selecting and practicing from one of CAD tool from CATIA or PRO/ENGINEER or SOLID WORK or AutoCAD 2000 for 3-D modeling; 5) Transformation to *.stl for 3-D Printer; 6) Rapid Prototyping; 7) Example of Design and Rapid prototyping; 8) Design Project and Presentation. (Wei-Hsiang Lai)

F435300 Aircraft Materials (-,3)

F420730 Engineering Mathematics III (3,-)
1) Calculus of Variation; 2) Partial Differential Equation: Separation of Variable; Integral Transfer; 3) Vector Analysis: Divergence Theory; Stokes Theory; Green Theory; 4) Difference Equation: Digital Processing; Z Transform; 5) Numerical Analysis. (Dr. C.M. Lee)

F440900 Introduction of Guidance and Navigation (3,-)

**F431300 System Dynamics Analysis (-,3)**


**F440500 Applied Linear Algebra(-,3)**


**F441700 Introduction to Combustion (-,3)**


F447600 Space Mechanics (3,-)
1) Overview; 2) Particle Dynamics; 3) The Two-Body Problem; 4) Earth Satellite Operations; 5) Rigid-Body Dynamics; 6) Satellite Attitude Dynamics; 7) Gyroscopic Instruments; 8) Rocket Performance; 9) Interplanetary Trajectories; 10) Conclusion Remarks. (Dr. Ching-Shun Ho)

F430210 Special Topics on Aerospace Implementation I (3,-)
1) Requirement of the Special Topics issued from the teachers; 2) Developing process of Industrial Products; 3) System Engineering and project guide; 4) Project Structure and Work Breakdown; 5) Information Collection; 6) Machine shop and warehouse training; 7) Progress discussion and design review; 8) Establish Prototyping; 9) Functional verification of prototyping; 10) Report and presentation. (Prof. Wei-Hsiang Lai)

F430220 Special Topics on Aerospace Implementation II (3,-)
1) Unmanned Aerial Vehicle Design; 2) Small Turbo Jet Engine Design; 3) Automatic Wind Tunnel Design. (Prof. Shieh, Chen)

F442000 Combustion Pollution Control (3,-)
1) Introduction; 2) National Legislation; 3) Combustion of
Hydrocarbon Fuels; 4) Emissions from Combustion Processes; 5) Dispersion of Pollutants in the Atmosphere; 6) Control of Pollutant Emissions; 7) Incineration Applications. (Prof. Keh-Chin Chang)

**F448100 Theory of Vibrations (3,-)**


**F448300 Control System Design (3,-)**


**F435700 Gasdynamics (3,-)**

1) Fundamental of fluid dynamics; 2) Introduction to compressible flow; 3) Isentropic flow; 4) Normal shock waves; 5) Frictional flow in constant-area; 6) Flow in constant area ducts with heat transfer; 7) Steady and two-dimensional supersonic flows. (Prof. Shen-Min Liang)

**F435700 Gasdynamics (3,-)**

1) Fundamental Concepts and Definitions; 2) Integral Forms of the Conservation Equations; 3) One-Dimensional Flows; 4) Oblique Shock Waves and Expansion Waves; 5) Quasi-One-dimensional

F441400 Computer Control of Feedback System (-,3)
Graduate Part:

**P440900 Aviation Safety (3,-)**

**P450110-20 Advanced Engineering Mathematics I-II (3,3)**

**P451010-20 Engineering Acoustics I-II (3,3)**

**P451700 Turbulence (3,-)**

3-120

**P452210-20 Computational Fluid Dynamics I-II (3,3)**


**P453200 Advanced Thermodynamics (3,-)**

P453310-20 Combustion Theory I-II (3,3)


P454300 Conduction Heat Transfer (3,-)


P455700 Structural Dynamics (3,-)

(Prof. Hung-Sying Jing)

P455500 Finite Element Methods in Structures (3, -)
1) Matrix and Linear Algebra; 2) Truss and Beam Elements; 3) Plane Stress and Plane Strain Elements; 4) Axisymmetric and Solid Elements; 5) Numerical Integration and Curved Isoparametric Elements; 6) Plate Elements; 7) Application of FEM on Structural Dynamics. (Prof. Le-Chung Shiau)

P455800 Optimal Filtering Theory and Its Application (3, -)
1) Introduction; 2) Fundamentals of Vector and Matrix Operations; 3) Least Squares Techniques and Batch Processing Filters; 4) Linear Dynamical System and Recursive Processing; 5) Stochastic Process and Optimal Linear Filters; 6) Nonlinear Estimation; 7) Concluding Remarks. (Dr. Ching-Shun Ho)

P456700 Elasticity (3,-)
1) Introduction to Tensor Analysis; 2) Continuum Mechanics (Cartesian and general curvilinear coordinates); 3) Nonlinear Elasticity: General Equations: Stress-strain relations, etc.; 4) Linear Elasticity: Uniqueness of solution, Methods of solutions, Plane stress and strain problems, Contact problems, Indention and crack problems; 5) Waves in Elastic Solids; 6) Variational Theorems. (Prof. Lee-Jen Lee)
P457700 Principles of Instrumentation Control (3,-)

P459200 Turbo Engine Principles (3,-)

P459500 Laser Engineering (3,-)

P460500 Aerodynamics (3,-)
1) Review of Fundamentals of Fluid Mechanics; 2) Classical Theories of Inviscid Incompressible Flow; 4) 2D Thin Wing Theory in Subsonic and Supersonic Flows; 5) 3D Lifting-Line and
Lifting-Surface Theories; 6) Slender Body Theory. (Prof. Fei-Bin Shiao)

P460800 Introduction to Propulsion (3,-)

P460900 Fluid Dynamics (4,-)
1) Fundamentals of continuum mechanics and kinematics; 2) Equation of motion of Newtonian fluids; 3) Hydrostatics; 4) Laminar unidirectional flows; 5) Fundamentals of turbulent flow; 6) Potential flows; 7) Supersonic flows; 8) Boundary layer theory. (Prof. Chii-Jong Hwang)

P462500 Introduction to Biomedical Fluid (3,-)

P463600 Dynamic Fluid Mechanics Measurements (3,-)
1) General Considerations in Physical Data and Data Processing; 2) Review of Stationary Random Processes Theory; 3) Basic
Non-optical Flow visualization and Measurements; 4) Review of Principles of Optics and Optical Systems; 5) Basic Principles of Laser-Doppler Velocimetry (LDV); 6) LDV Optical Components; 7) LDV Signal processing; 8) Principles of Particle Image Velocimetry (PIV); 9) Image Processing; 10) Other Flow Measurements Systems. (Prof. Yei-Chin Chao)

P463800 Quantum Fluid Dynamics Theory and Application (3,-)  
1) Fundamentals of quantum mechanics; 2) Equivalence principles and fluid dynamic representation of Schrodinger liner and non-liner quantum systems. Hamilton-Jacobi, Madelung, Bohm, Chiu formalisms; 3) Basic theorems of non-relativistic quantum fluid dynamics. Quantum Bernoulli’s equation, laws of quantum vorticities, quantum hydrodynamic and gasdynamic discontinuities; 4) Quantum subsonic, supersonic and hypersonic flows in many-particle non-linear Scrodinger systems; 5) Quantum vortex dynamics and superfluidities; 6) Fluid dynamics of quantum structures: quantum dots, channels, circuits and slabs; 7) Fluid dynamics of models of artificial atoms and molecules; 8) Quantum transport processes and flow structures; quantum tunneling phenomena; 9) Quantum electro-magneto hydrodynamics; 10) Superconductivity phenomena; 11) Applications: Nano-particle, nano-jet, nano-structures, neon-electronics and quantum circuits. (Prof. H.H. Chiu)

P468300 Orbital Mechanics (3,-)  
1) Introduction; 2) Two-Body Orbital Mechanics; 3) Orbit Determination; 4) Time of Flight; 5) The Gauss Problem; 6) Ballistic Missile Trajectories; 7) Lunar Trajectories; 8) Interplanetary
Trajectories; 9) Three-Body Orbits; 10) Perturbations. (Prof. Dong-Long Sheu)

**P470200 Picosat System Engineering (3,-)**

**P473800 Experimental Stress Analysis (3,-)**

**P474100 Structural Mechanics of Flight Vehicles (3,-)**
1) Characteristics of Aircraft Structures; 2) Introduction to Elasticity; 3) Torsion; 4) Bending and Flexural; 5) Shear Flow and Deflection; 6) Failure Criteria For Materials; 7) Buckling; 8) Analysis of Composite Laminates. (Prof. Dar-Yun Chiang)

**P476600 Plates and Shells (3,-)**
Differential Geometry; 12) Thin Elastic Shells; 13) Membrane Stresses in Shells; 14) Bending Stresses in Shells. (Prof. Chyanbin Hwu)

**P477300 Linear System Theory (3, -)**

The purpose is to characterize the dynamics of linear system and its application to control problems. The contents, therefore, include mathematic fundamentals such as Real Analysis, Linear Algebra and Ordinary Differential Equation; State-space Representation (SSR); Controllability, Observability; Realization and Singular Value Decomposition (SVD). For stability, we discuss aspects like Bounded-imput-bounded-output (BIBO) and Lyapnov Theory. All these are, then, applied to the optimal feedback control design. (Prof. Jiun-Haur Tarn)

**P477400 Optimal Control Theory (3, -)**


**P484300 Analysis of Aircraft Performance (3,-)**

1) The evolution of the airplane and its performance; 2) Aerodynamics of the airplane; 3) Some propulsion characteristics; 4) Equations of motion; 5) Aircraft performance: steady flight; 6)
Aircraft performance: Accelerated flight.(Prof. Fei-Bin Shiao)

**P484600 Reinforcement Learning Theory and Application (3,-)**
1) Introduction to reinforcement learning; 2) Markov Decision Process; 3) Dynamic Programming; 4) Temporal-difference; 5) Monte Carlo methods; 6) Eligibility traces; 7) Networks Theory; 8) Integration of learning, planning and their applications. (Prof. Jiun-Haur Tarn)

**P484700 Aircraft Dynamics(3,-)**

**P491800 Introduction to Microfabrication and MEMS (3,-)**
1) Introduction to physical phenomena in microscale; 2) Scaling rules: What happen in small work?; 3) Basics of microfabrication process: Photolithography, thin film deposition, etching, LPCVD etc. 4) Fundamentals of bulk micromachining and examples: isotropic and anisotropic etching, dry etching; 5) Surface micromachining and examples: sacrificial layers, thin-film deposition, etching and releasing; 6) Combination of surface and bulk processing. (Prof. Tzong-Shyng Leu)
P431500 Theory and Experiment of Navigation with Satellites (-,3)

P442800 Airline Operation and Management (-,3)

P442900 Aviation Human Factor Engineering (-,3)
1) Aviation Psychology: Cognition in Aviation; Stress and its Management; Pilot Selection; Pilot Training; Special Topics, 2) Aviation Physiology: Flight Environment; Acceleration Physiology; Spatial Disorientation; Stress and its Management; Special Topics; 3) Human Factors in Aviation: Pilot Dynamics; Aircraft-Pilot Coupling; Aviation Display; Cockpit Automation; Air Traffic Control; Maintenance. (Prof. Huang-Sying Jing)

P443400 Neural Networks (-,3)
1) Introduction; 2) Learning Processes; 3) Single Layer Perceptrons; 4) Multilayer Perceptrons; 5) Radial-Basis Function

**P451500 Boundary Layer Phenomena (-,3)**
1) Introduction: boundary layer phenomenon, boundary layer assumption, and boundary layer equation; 2) Laminar boundary layer: similarity solutions (Blasius solution, Falkner-Skan solutions); 3) Integral method for boundary layer equation; 4) Turbulent boundary layer: inner and outer layers characteristics, log region, coherent structures in turbulent boundary layer; 5) Free shear layers: mean flow and turbulent fluctuations, characteristics of jet, wake and mixing layer; 6) Introduction of compressible boundary layer; 7) A term project of wind-tunnel experiment. (Prof. Chii-Jong Hwang)

**P453000 Rocket Propulsion (-,3)**

**P453300 Satellite Technology and Its Applications (-,3)**
1) Overview of Satellite Systems; 2) Orbits and Landing Methods; 3) The Space and Earth Segment; 4) Spacecraft Structure; 5) Attitude

P453600 Physical Gas Dynamics (-, 3)
1) Introductory Kinetic Theory; 2) Equilibrium Kinetic Theory; 3) Nonequilibrium Kinetic Theory; 4) Real Gas Effects and Properties of High Temperature; 5) Equilibrium and Frozen Flow (Prof. Yei-Chin Chao)

P454400 Convection Heat Transfer (-, 3)

P454500 Radiation Heat Transfer (-,3)
1) Introduction and Basic Issues; 2) Radiation Exchange in an Enclosure; 3) Radiation in the Presence of Other Modes of Energy Transfer; 4) Radiation in Absorbing, Emitting, and Scattering Media;
5) Approximate Solutions of the Equations of Radiative Transfer; 6) Gas Radiation in Enclosures. (Prof. Chie Gau)

P454600 Numerical Heat Transfer (-, 3)
1) Introduction; 2) Discretization Methods; 3) Direct and Iterative Methods; 4) SIMPLE Algorithm; 5) Curvilinear Coordinate Equations; 6) Gridding Techniques; 7) Physical Modelings. (Prof. Denz Lee)

P457900 Digital Control of Dynamic Systems (-, 3)
1) Introduction; 2) Z-transform; 3) Sampling and Reconstruction; 4) Open Loop Analysis; 5) Stability Analysis; 6) Digital Controller Design; 7) State Space Analysis; 8) Linear Quadratic Optimal Control. (Prof. Chen Hsieh)

P458100 System Identification (-, 3)
1) Introduction; 2) System Modeling; 3) Parameter Estimation; 4) Model Validations; 5) Filtering Theories; 6) Modal Parameter Identification; 7) Inverse Eigenvalue Problems; 8) Special Topics. (Prof. Dar-Yun Chiang)

P458200 Nonlinear Control (-,3)
P460200 Compressible Flow Theory and Experiments (-,3)

1) Review of the thermodynamics; 2) Conservation equations in integral and differential forms, the shock equations and the lift and drag of a body; 3) Steady one-dimensional flow theory with and without shock; 4) Linear propagation of waves; 5) Non-linear wave phenomena; 6) Linearized Two-Dimensional steady flow; 7) Non-linearized Two-Dimensional steady flow; 8) Measurement of pressure, temperature and velocity and observation flow field; 9) Engineering and applications: pressure-exchangers and pulsed combustors; 10) Concluding Remarks. (Dr. Fan-Ming Yu)

P460400 Shock Dynamics (-,3)


P461900 Experimental Fluid Dynamics (-,3)

1) The role of experiments in fluid dynamics research; 2) Introduction of experimental facilities; 3) Introduction of instrumentation and data acquisition; 4) Describing the experimental uncertainties; 5) Flow visualization: dye visualization for the phenomenon of Karman vortex street; dye visualization of limiting streamline pattern on a 3-D body; 6) Velocity measurements in a wake using a pitot tube and hot-wire anemometers; 7) Drag
measurement of flow over a circular cylinder; 8) Lift measurement of an aerodynamic body in transonic flow. (Prof. Jiun-Jih Miau)

P465800 Optimum Structural Design ( -,3)

1) Introduction to Optimization; 2) Classical Optimization Techniques; 3) Linear Programming; 4) Quadratic Programming; 5) Nonlinear Programming; 6) Structural Optimization; 7) Further Topics in Optimization. (Prof. Chyanbin Hwu)

P468400 Advanced Topics on Control System Design ( -,3)

1) Robust Control System Analysis & Design; 2) Intelligent Control System; 3) Genetic Algorithm and Optimization of Control Systems. (Prof. Chieh-Li Chen)

P466200 H-∞-Control Theory and Design ( -,3)


ntroller; 8) Linear Factorization Transformation; 9) Riccati Equation and Spectral Factorization; 10) Synthesis of $H_\infty$ Controller; 11) Selection of Weighting Function; 12) Case Study. (Prof. Ciann-Dong Yang)

P466200 $H_\infty$-Control Theory and Design (-,3)

P457500 Aircraft Stability and Control (-, 3)
P468400 Advanced Topics on Control System Design (-,3)
1) Aims of multivariable control; 2) Basic control system structures; 3) Control problem formulation; 4) LQG/LTR method; 5) Sliding mode control system; 6) Fuzzy control; 7) Introduction to genetic algorithm. (Prof. Chieh-Li Chen)

P471300 Gasdynamics (-,3)

P472010 Engineering Quantum Mechanics (-,3)
P476900 Mechanics of Composite Materials (3,3)

P481200 Spacecraft Attitude Dynamics (3,3)
   1) Mathematics (summation convention); 2) Kinematics of Attitude; 3) Gravitational Force; 4) Dynamics of Attitude; 5) Satellite Dynamics. (Prof. Shieh, Chen)

P484500 Theory of System Engineering and Application (3,3)
   1) Systems Engineering Fundamentals; 2) Aircraft Systems; 3) Aircraft Systems Engineering; 4) Programmatic Applications with Demos. (Prof. Jiun-Haur Tarn)

P487200 Optimal Trajectories in Atmospheric (3,3)

P490200 Experimental Methods in Aeronautical & Astronautical Engineering (3,3)
   1) Experiment on Electronical Fundamental Techniques and Its

P491300 Numerical Analysis (3, -)

P450500 System Engineering and Management (-,3)

P455100 Advanced Dynamics (-,3)
P459600 Optronics Engineering (-, 3)

P493700 Micro Sensors (3,-)

P493600 Microelectromechanical System Design (-,3)
   1) Introduction of MEMS; 2) Design methods; 3) MEMS foundry service and their design rules: MCNC, MOSIS 4) Micro motor design; 5) Micro accelerometer design; 6) Micro pressure sensor design; 7) Micro flow sensor design; 8) Micro thermal sensor design; 9) Micro gripper design; 10) Micro structure design. (Prof. Tzong-Shyng Leu)

P493800 Signal Processing System (-,3)
   1) Fourier Series in Spectral Analyses; 2) The Time and Discrete Frequency Domains; 3) Fourier and Laplace Transform (with Matlab simulation); 4) Designs of Analog Filters (with Matlab simulation); 5) Digitization of Analog Signals (with Matlab simulation); 6) Sampling, Interpolation and Sampling Theorem; 7) Window and

P493900 Special Topics on Microfluidic Devices (-,3)

1) Introduction of microfluidic devices; 2) Special topics: Thermal bubble inkjet printhead, Basic thermodynamics for thermal bubble inkjet printhead, Basic hydrodynamics instability theory for droplet ejection, Basic microchannel flow theory for repetition rate analysis; 3) Inkjet printhead fabrication; 4) Inkjet printhead performance test.

(Prof. Tzong-Shyng Leu)

P494000 Principles of Numerical Control Machining (-,3)


P495100 Engineering Analysis (-,3)

1) Vector Analysis; 2) Linear Algebra; 3) Ordinary Differential Equations; 4) Partial Differential Equations. (Prof. Keh-Chin Chang)
P499800 Dynamic Analysis of Rotor-Bearing Systems (-,3)

1) Introduction; 2) Analysis of Rotor Motion; 3) Single-mass Rotordynamics; 4) Systems with Many D.O.F.; 5) Torsional Vibrations; 6) Instability in Rotating Machines; 7) Balancing of Rotors; 8) Bearings and Dampers; 9) Measurements and Diagnostics; 10) Rotordynamics Software. (Prof. Siu-Tong Choi)

P474200 Sources of Vorticity

1.1 The continuity equation; 2) The momentum equation; 3) Rotation imparted to material element by stresses; 4) The baroclinic torque; 5) The vorticity transport equation; 6) Special material properties; 7) Accelerated frames of references, body forces; 8) Vorticity sources in numerically computed flows; 9) Merging flows; 10) Separation; 11) Miscellaneous example (Prof. Chih-Yung Wen)

P474400 Theory and Practice of Fuel Cell (3,-)


P474400 Molecular Dynamics (-,3)
1) Micro- and macro-scale systems, 2) Kinetic theory and statistical physics, 3) Boltzmann equation, 4) Hard-sphere model, 5) Molecular dynamics method (MD), 6) Monte Carlo method (MC), 7) Time-integration of equation of motion and ensemble average, 8) Programming and computer simulation, 9) Equilibrium and non-equilibrium analysis, 9) Special topics (nano-scale phase transition, nanoimprint, carbon fullerene, sputtering, vacuum, etc.)

(Prof. Chin-Hsiang Cheng)