Tamkang University Academic Year 112, 1st Semester Course Syllabus

Course Title	ELECTROMAGNETICS IN AEROSPACE	Instructor	WANG KAITI
Course Class	TENXM1A MASTER'S PROGRAM, DEPARTMENT OF AEROSPACE ENGINEERING, 1A	Details	◆ General Course ◆ Selective ◆ One Semester
Relevance to SDGs	SDG4 Quality education SDG13 Climate action		

Departmental Aim of Education

Ⅰ. To lay down a concrete foundation of professional ethics in aerospace and aeronautical engineering, and to cultivate the students' ability in multidisciplinary expertise and continuous learning.

Ⅱ. To setup the students' hands-on ability of and the ability in resolving problem, so that both practical implementations and theories can be emphasized.

Ⅲ. To foster students with diligent and sociable attitude in work, and broadeded international perspective.

Subject Departmental core competences

A. To equip with specific aerospace engineering knowledge and expertise.(ratio:30.00)

B. Be able to master information, capable of utilizing computer to assist solving problems, and possess the ability of conducting learning new knowledge.(ratio:40.00)

C. Be able to design and conduct experiments as well as to analyze, and to solve practical aerospace related engineering problems.(ratio:10.00)

D. Be able to write professional research papers in the field of aerospace engineering. (ratio:10.00)

E. Have a creative thinking, complete analyzing, effective communication, the spirit of teamwork and the ability to solve industrial problems.(ratio:10.00)

Subject Schoolwide essential virtues

1. A global perspective. (ratio:30.00)
2. Information literacy. (ratio:25.00)
3. A vision for the future. (ratio:10.00)
4. Moral integrity. (ratio:5.00)
5. Independent thinking. (ratio:15.00)
6. A cheerful attitude and healthy lifestyle. (ratio:5.00)

7. A spirit of teamwork and dedication. (ratio:5.00)

8. A sense of aesthetic appreciation. (ratio:5.00)

Course Introduction	This course will introduce fundamental space plasma physics including electromagnetic equations, single-particle motions, plasmas as fluids, and waves in plasmas. This course will also introduce the space environment, satellite observations, and space weather. The space environment will be covered from the Sun, solar wind, to our magnetospheres.

The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.

II.Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.

III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

No.	Teaching Objectives	objective methods
1	1. Knowledge of fundamental equations of electromagnetics and space plasma physics. 2. Knowledge of motion of charged particles in electromagnetic environment. 3. Knowledge of solar-terrestrial environment from the Sun to Earth. 4. Knowledge of particles and waves observations from satellite missions.	Cognitive

The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCDE	12345678	Lecture, Discussion, Practicum	Testing, Study Assignments, Discussion(including classroom and online), Report(including oral and written), Activity Participation

Course Schedule			
Week	Date	Course Contents	Note
1	112/09/11 ~ 112/09/17	Definition of Plasma, Temperature, Debye Shielding	
2	112/09/18 ~ 112/09/24	The Plasma Parameter, Criteria for Plasmas, Plasmas in Space, Ion Propulsion	
3	112/09/25 ~ 112/10/01	Single-Particle Motions: Uniform E and B fields	
4	112/10/02 ~ 112/10/08	Single-Particle Motions: Nonuniform B field	
5	112/10/09 ~ 112/10/15	Adiabatic Invariants	
6	112/10/16 ~ 112/10/22	Plasmas as Fluids: Relation to Ordinary Electromagnetics	
7	112/10/23 ~ 112/10/29	The Fluid Equation of Motion: Complete Set of Fluid Equations	
8	112/10/30 ~ 112/11/05	Waves in Plasmas	
9	112/11/06 ~ 112/11/12	Midterm Exam Week	
10	112/11/13 ~ 112/11/19	Waves in Plasmas	
11	112/11/20 ~ 112/11/26	Waves in Plasmas and Satellite Observations	
12	112/11/27 ~ 112/12/03	Energetic Particle Sources and Satellite Observations	
13	112/12/04 ~ 112/12/10	Solar-Terrestrial Interactions, Magnetosphere, Radiation Belt, Space Weather	
14	112/12/11 ~ 112/12/17	Lunar Environment I : Waves, Particles, Magnetic Fields	
15	112/12/18 ~ 112/12/24	Observational Data Analysis via SPEDAS	
16	112/12/25 ~ 112/12/31	Review and Project with SPEDAS	
17	113/01/01 ~ 113/01/07	Final Exam Week	
18	113/01/08 ~ 113/01/14	Final Exam Results Review	
Key capabilities		Problem solving	
Interdisciplinary			

Distinctive teaching	
Course Content	Logical Thinking
Requirement	
Textbooks and Teaching Materials	Self-made teaching materials:Presentations, Handouts, Videos Using teaching materials from other writers:Textbooks Name of teaching materials: Chen, F. F. (2016). Introduction to Plasma Physics and Controlled Fusion, 3rd Edition, Springer.
References	Kivelson, M. G., and C. T. Russell, Introduction to Space Physics, 1st Edition, Cambridge University Press, 1995 Gurnett, D. A., and A. Bhattacharjee, Introduction to plasma physics : with space, laboratory and astrophysical applications, Cambridge University Press, 2017
Grading Policy	◆ Attendance： 5.0 % ◆ Mark of Usual：30.0 % ◆ Midterm Exam： 30.0 % ◆ Final Exam： 30.0 % ◆ Other〈InClass Activities〉：5.0 %
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at http://info.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php . **※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.**