

## Tamkang University Academic Year 111, 2nd Semester Course Syllabus

Course Title	INTRODUCTION OF ELECTRON MICROSCOPY	Instructor	CHIANG, CHENG-TIEN
Course Class	TSAXB4A BACHELOR'S PROGRAM IN ADVANCED MATERIALS SCIENCE, 4A	Details	<ul style="list-style-type: none"> <li>◆ General Course</li> <li>◆ Selective</li> <li>◆ One Semester</li> </ul>
Relevance to SDGs	SDG4 Quality education		
<b>Departmental Aim of Education</b>			
<ul style="list-style-type: none"> <li>I. Enrich the fundamental knowledge of advanced material sciences.</li> <li>II. Emphasize the ability of self-expression.</li> <li>III. Strengthen the ability to experiment and team spirit.</li> <li>IV. Develop an international perspective and international exchanges.</li> </ul>			
<b>Subject Departmental core competences</b>			
<ul style="list-style-type: none"> <li>A. Possess a fundamental knowledge of mathematics, physics, chemistry and biology. (ratio:50.00)</li> <li>B. Cultivate professional knowledge, experimental skills and the applications of nano, optoelectronic, biomedical and macromolecular materials.(ratio:50.00)</li> </ul>			
<b>Subject Schoolwide essential virtues</b>			
<ul style="list-style-type: none"> <li>1. A global perspective. (ratio:10.00)</li> <li>2. Information literacy. (ratio:10.00)</li> <li>3. A vision for the future. (ratio:5.00)</li> <li>4. Moral integrity. (ratio:5.00)</li> <li>5. Independent thinking. (ratio:30.00)</li> <li>6. A cheerful attitude and healthy lifestyle. (ratio:5.00)</li> <li>7. A spirit of teamwork and dedication. (ratio:30.00)</li> <li>8. A sense of aesthetic appreciation. (ratio:5.00)</li> </ul>			

Course Introduction	Introduction of electron microscopies and their applications, including the basics of optics, electron optics, and their instrumentation.
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**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	Knowledge of electron microscopies	Cognitive

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

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	AB	12345678	Lecture, Discussion	Discussion(including classroom and online), Report(including oral and written)

Course Schedule

Week	Date	Course Contents	Note
1	112/02/13 ~ 112/02/19	overview, geometric optics, Fermat principle	
2	112/02/20 ~ 112/02/26	mirror, prism, lens	
3	112/02/27 ~ 112/03/05	vector field, gradient, curl, divergence	
4	112/03/06 ~ 112/03/12	Maxwell equations	
5	112/03/13 ~ 112/03/19	wave equation, Huygens-Fresnel principle	

6	112/03/20 ~ 112/03/26	paraxial wave equation	
7	112/03/27 ~ 112/04/02	focus, plan-apochromat objective	
8	112/04/03 ~ 112/04/09	no class (teaching observation day)	
9	112/04/10 ~ 112/04/16	interference, diffraction, grating, optical microscope	
10	112/04/17 ~ 112/04/23	Midterm Exam Week	
11	112/04/24 ~ 112/04/30	spherical and chromatic aberrations, Abbe number	
12	112/05/01 ~ 112/05/07	optical microscope	
13	112/05/08 ~ 112/05/14	cathod ray, magnetic lens	
14	112/05/15 ~ 112/05/21	electrostatic lens, electron microscope	
15	112/05/22 ~ 112/05/28	Graduate Exam Week	
16	112/05/29 ~ 112/06/04	---	
17	112/06/05 ~ 112/06/11	---	
18	112/06/12 ~ 112/06/18	---	
Requirement	general physics		
Teaching Facility	Computer, Other (beamer and screen)		
Textbooks and Teaching Materials	Slides of the lecture		
References	<p>Introduction to optics, G. Chartier, ISBN: 978-0-387-27598-7,  <a href="https://doi.org/10.1007/b106780">https://doi.org/10.1007/b106780</a></p> <p>Physical principles of electron microscopy - an introduction to TEM, SEM, and AEM, R.F. Egerton, ISBN: 978-3-319-39877-8, <a href="https://doi.org/10.1007/978-3-319-39877-8">https://doi.org/10.1007/978-3-319-39877-8</a></p> <p>Transmission electron microscopy - a textbook for materials science, part I. basics, D. B. Williams and C. B. Carter, ISBN: 978-0-387-76501-3,  <a href="https://doi.org/10.1007/978-0-387-76501-3">https://doi.org/10.1007/978-0-387-76501-3</a></p> <p>Introduction to electrodynamics, D. J. Griffiths, ISBN: 978-1108420419,  <a href="https://doi.org/10.1017/9781108333511">https://doi.org/10.1017/9781108333511</a></p> <p>Scanning probe microscopy - atomic force microscopy and scanning tunneling microscopy, B. Voigtlander, ISBN: 978-3-662-45240-0,  <a href="https://doi.org/10.1007/978-3-662-45240-0">https://doi.org/10.1007/978-3-662-45240-0</a></p> <p>Surface microscopy with low energy electrons, E. Bauer, ISBN: 978-1-4939-0935-3,  <a href="https://doi.org/10.1007/978-1-4939-0935-3">https://doi.org/10.1007/978-1-4939-0935-3</a></p>		

Number of Assignment(s)	1 (Filled in by assignment instructor only)
Grading Policy	<p>◆ Attendance : 40.0 %   ◆ Mark of Usual : 20.0 %   ◆ Midterm Exam : %</p> <p>◆ Final Exam : %</p> <p>◆ Other (oral report) : 40.0 %</p>
Note	<p>This syllabus may be uploaded at the website of Course Syllabus Management System at <a href="http://info.ais.tku.edu.tw/csp">http://info.ais.tku.edu.tw/csp</a> or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at <a href="http://www.acad.tku.edu.tw/CS/main.php">http://www.acad.tku.edu.tw/CS/main.php</a>.</p> <p><b>※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</b></p>