Tamkang University Academic Year 113, 2nd Semester Course Syllabus

Course Title	THE DESIGN OF A NANO-MATERIAL APPLIED BIO-CHIP	Instructor	LEE TZUNG-HANG
Course Class	TEBXM1A MASTER'S PROGRAM, DEPARTMENT OF MECHANICAL AND ELECTRO-MECHANICAL ENGINEERING, 1A	Details	◆ General Course ◆ Selective ◆ One Semester ◆ 3 Credits
Relevance to SDGs	SDG3 Good health and well-being for people SDG4 Quality education SDG7 Affordable and clean energy SDG9 Industry, Innovation, and Infrastructure		

Departmental Aim of Education

Ⅰ. To prepare students who have a comprehensive understanding of the principles of applied sciences and engineering to be innovators in the field of mechanical and electromechanical engineering.

Ⅱ. To train emerging professionals who possess a high level of expertise and ethical standards who will become independent research and development leaders in the industry.

Ⅲ. To motivate students who will pursue continuing education as a means to stay on the cutting edge of global competiveness and meet changes in their careers and the workplace with confidence and ease.

Subject Departmental core competences

A. Head: Knowledge of mechanical and electromechanical engineering.(ratio:30.00)

B. Hand: Hands-on skills and practical realization.(ratio:30.00)

C. Heart: Love of learning and innovation.(ratio:20.00)

D. Eye: Vision of progress and improvements.(ratio:20.00)

Subject Schoolwide essential virtues

1. A global perspective. (ratio:10.00)

2. Information literacy. (ratio:30.00)

3. A vision for the future. (ratio:20.00)

4. Moral integrity. (ratio:5.00)

5. Independent thinking. (ratio:20.00)

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 intends to develop students' ability in biochip design combining with nano-materials. Current issues related to biomedical engineering will be mentioned. The type, the characteristics, and the present status of 4 Different kinds of biochip (gene chip, protein chip, DDS chip and Lab on a chip) will be introduced. The types, properties and applications of nano-materials will also be discussed.

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	General Introduction to Bio-Tecs	Cognitive
2	Introduction of Nanobiological Medicine	Cognitive
3	General Introduction to Bio-chips	Cognitive
4	Introduction of Gene Chips-I &II	Cognitive
5	Introduction of Protein Chips-I & II	Cognitive
6	ELISA (Enzyme-Linked ImmunoSobent Assay) SPR (Surface Plasmon Resonance) PCR (Polymerase Chain Reaction)	Cognitive
7	Introduction of Lab-on-a-Chip	Cognitive
8	Introduction of DDS Bio-chips	Cognitive
9	Introduction to Nano-material Applications on A DDS Bio-chip	Cognitive
10	Methodology applied in Designing A DDS Bio-chips	Cognitive
11	Design of A DDS Bio-Chip	Cognitive

The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment				
No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
2	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
3	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
4	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
5	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
6	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
7	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
8	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)

9	ABCD	12345678	Lecture, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
10	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)
11	ABCD	12345678	Lecture, Discussion, Practicum, Imitation	Testing, Discussion(including classroom and online), Practicum, Report(including oral and written)

Course Schedule

Week	Date	Course Contents	Note
1	114/02/17 ~ 114/02/23	Introduction-Biosensor Bio-chips(I)	
2	114/02/24 ~ 114/03/02	Introduction-Biosensor Bio-chips(II)	
3	114/03/03 ~ 114/03/09	Introduction- Bio-Tecs(I)	
4	114/03/10 ~ 114/03/16	Introduction- Bio-Tecs(II)	
5	114/03/17 ~ 114/03/23	Gene Chips(I)	
6	114/03/24 ~ 114/03/30	Gene Chips(II)	
7	114/03/31 ~ 114/04/06	教學觀摩週	
8	114/04/07 ~ 114/04/13	Protein Chips(I)	
9	114/04/14 ~ 114/04/20	期中考試週	
10	114/04/21 ~ 114/04/27	Protein Chips(II)	
11	114/04/28 ~ 114/05/04	Micro-array(I)	
12	114/05/05 ~ 114/05/11	Micro-array(II)	
13	114/05/12 ~ 114/05/18	PCR	
14	114/05/19 ~ 114/05/25	Lab-on-a-Chip	
15	114/05/26 ~ 114/06/01	Introduction-DDS Bio-chips	
16	114/06/02 ~ 114/06/08	Methodology applied in Designing A DDS Bio-chips	

17	114/06/09～ 114/06/15	期末考試週	
18	114/06/16～ 114/06/22	Design of A DDS Bio-Chip	

Key capabilities	self-directed learning International mobility Information Technology Problem solving Interdisciplinary
Interdisciplinary	STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist) Competency-based education 'competency exploration' sustained competency or global issues STEEP (Society, Technology, Economy, Environment, and Politics) In addition to teaching content of the teacher's professional field, integrate other subjects or invite experts and scholars in other fields to share knowledge or teaching
Distinctive teaching	Industry-university collaboration courses Project implementation course Special/Problem-Based(PBL) Courses
Course Content	Intellectual Property (learning intellectual property) Logical Thinking AI application
Requirement	
Textbooks and Teaching Materials	Self-made teaching materials:Presentations, Handouts, Videos Using teaching materials from other writers:Videos, news & publications
References	1. Microarray analysis,Wiley-Liss company, by Mark Schena 2. Biochip Technology, Taylor Francis Group, by J. Chen & L. J. Kricka 3. Applying Genomic and Proteomic Microarray Technology in Drug Discovery, CRC Press, by R. Matson 4. A Beginner's Guide to Microarrays, Kluwer Academic Publishers, by Eric M. Blalock 5. DNA Microarrays and Gene Expression, Cambridge University Press, by Pierre Baldi, Wesley G. Hatfield 6. Protein Microarray Technology, John Wiley & Sons, by Dev Kambhampati 7. Integrated Microfabricated Biodevices, Marcel Dekker, by M. J. Heller & A. Guttman 8. Data Analysis Tools for DNA Microarrays, CRC Press, by Sorin Draghici
Grading Policy	◆ Attendance： % ◆ Mark of Usual： % ◆ Midterm Exam： 30.0 % ◆ Final Exam： 30.0 % ◆ Other〈期中報告、期末報告、上台報告〉：40.0 %

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.**