Course Title	ESSENTIALS OF SOC DESIGN	Instructor	
Course Class	TEBXD1A DOCTORAL PROGRAM, DEPARTMENT OF MECHANICAL AND ELECTRO-MECHANICAL ENGINEERING, 1A	Details	◆ General Course ◆ Selective ◆ One Semester ◆ 1 Credits
Relevance to SDGs	SDG4 Quality education SDG17 Partnerships for the goals		

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:20.00)

2. Information literacy. (ratio:15.00)

3. A vision for the future. (ratio:15.00)

4. Moral integrity. (ratio:5.00)

5. Independent thinking. (ratio:30.00)

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 18-hour short course introduces the fundamentals of System-on-Chip (SoC) design, focusing on architecture, processor selection, and memory components for optimized performance. The course covers key topics such as bus architectures, interconnects, and customization techniques tailored to application-specific needs. Through theoretical and practical modules, students will gain the skills to design, analyze, and implement efficient SoC systems. Case studies on applications like AES, JPEG compression, and MP3 decoding provide real-world insights.

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.Introduce the fundamentals of System-on-Chip (SoC) design, including core architecture and design strategies. 2.Explore processor selection and customization techniques for optimized SoC performance. 3.Analyze memory components essential for efficient data handling in SoCs. 4.Understand bus architectures and interconnects for effective SoC communication. 5.Apply customization techniques to meet specific application requirements in SoC design.	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	Testing, Report(including oral and written)

Course Schedule			
Week	Date	Course Contents	Note
1	114/02/17 ~ 114/02/23	Overview of SoC integration and design complexity	

2	114/02/24 ~ 114/03/02	Exploration of various design approaches for SoC	
3	114/03/03 ~ 114/03/09	Key trade-offs in SoC design (area, time, power)	
4	114/03/10 ~ 114/03/16	Behavioral synthesis and design considerations	
5	114/03/17 ~ 114/03/23	Types of processors used in SoC (e.g., RISC, superscalar)	
6	114/03/24 ~ 114/03/30	Processor instruction set and selection criteria	
7	114/03/31 ~ 114/04/06	Basics of instruction sets and pipelines	
8	114/04/07 ~ 114/04/13	Branch handling and cost-reduction techniques	
9	114/04/14 ~ 114/04/20	Design of cache and scratchpad memory	
10	114/04/21 ~ 114/04/27	Internal vs. external memory in SoC	
11	114/04/28 ~ 114/05/04	Cache organization and write policies	
12	114/05/05 ~ 114/05/11	Line replacement strategies and memory optimization	
13	114/05/12 ~ 114/05/18	Overview of standard bus architectures	
14	114/05/19 ~ 114/05/25	System-level interconnections in SoC	
15	114/05/26 ~ 114/06/01	Basics of NoC design and applications of NoC in complex SoC	
16	114/06/02 ~ 114/06/08	Case studies: AES	
17	114/06/09 ~ 114/06/15	Case studies:JPEG compression	
18	114/06/16 ~ 114/06/22	Case studies: MP3 audio decoding	

Key capabilities	Interdisciplinary
Interdisciplinary	STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)
Distinctive teaching	visiting professors

Course Content	Computer programming or Computer language (students have hands-on experience in related projects) Logical Thinking
Requirement	
Textbooks and Teaching Materials	Self-made teaching materials:Handouts
References	1.　Michael J. Flynn and Wayne Luk, Computer System Design: System-on-Chip, John Wiley and Sons, 2011. 2.　　　Rahul Dubey, Introduction to Embedded System Design Using Field Programmable Gate Arrays, Springer Verlag London Ltd., 2009. 3.　　　　　　Steve Furber, System-on-chip Architecture, Addison-Wesley, 2000. 4.　　　nanoHUB Courses: ECE 695R: System-on-Chip Design
Grading Policy	◆ Attendance： 40.0 ％　◆ Mark of Usual： ％　◆ Midterm Exam： 30.0 ％ ◆ Final Exam： 30.0 ％ ◆ Other〈 〉： ％
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.**