# Syllabus of Record

**Program**: CET Taiwan
**Course Code / Title**: TP/BUSN 360 Semiconductors in a Changing World
**Contact Hours**: 45
**Recommended Credits**: 3
**Primary Discipline / Suggested Cross Listings**: Business / Public Policy, East Asian Studies, International Relations
**Language of Instruction:** English
**Prerequisites / Requirements**: None

---

## Description

Semiconductors occupy a pivotal position in both Taiwan's political economy and the contemporary international order, yet the material processes and the actors through which a chip comes into being are not well understood among the general public. Taking Taiwan's semiconductor industry as its principal case, this course examines the interrelationship of technology, power, and society. It first situates the industry within Taiwan's economic and industrial history, with attention to the role of the state, the configuration of the island's industrial structure, and the emergence of the Hsinchu Science Park. It then considers the geopolitical conditions and supply chain arrangements under which the industry operates. The central portion of the course reconstructs the trajectory of a chip from mining and metallurgy, through lithography, cutting, testing, packaging, to shipment. Rather than providing technical instruction in fabrication, the course cultivates an integrated, behind-the-scenes understanding of how chips are produced and of the actors involved at each stage, analogous to the cross-functional perspective required of a policy analyst. It concludes by examining questions regarding the environmental cost, societal implications, and the industry's future development.

## Objectives

Through their participation in this course, students will:

- Understand Taiwan's economic and industrial history, including the role of the state in industrial development and the structure of the island's industries.
- Trace the production trajectory of a chip from mining and raw materials through fabrication to shipment, and identify the actors involved at each stage.
- Critically analyze the ways in which geopolitical conditions and supply chain arrangements shape the semiconductor industry, together with questions of environmental cost and societal inequalities.
- Apply analytical perspectives from the course to evaluate the challenges and prospects confronting the industry.

# Syllabus of Record

**Requirements**
Active participation is essential in this course. Students are expected to attend each class and field study course component as outlined in the CET Attendance Policy. Students are expected to read all assigned materials before the relevant class session and come prepared to participate thoughtfully in class discussions. Reading assignments average 30-40 pages per class session. All assignments must be submitted via Canvas unless otherwise noted.

Graded assignments include:

- **Participation:** Students are expected to contribute actively to class discussions, linking the concepts and terms from the readings, lectures, and presentations with their own comments and observations.

- **Case study**: Find a lesser-known tech company from Taiwan and analyze its standing in the global market.

- **Quizzes:** 2 short quizzes to test students' comprehension of readings. Quizzes will include multiple choice and essay questions.

- **Discussion leadership:** Each student selects 2 assigned readings and leads a 20-minute discussion which includes a summary, critique, and a discussion question.

- **Final paper:** A research paper (10-12 pages) on a topic determined in consultation with the faculty member, culminating in a 10-minute presentation to the class.

**Grading**

The final grade is determined as follows:

| | |
|---|---|
| Participation *(see rubric below)* | 15% |
| Case study | 20% |
| Quizzes (2 at 10%) | 20% |
| Discussion leadership (2 at 10%) | 20% |
| Final paper | 25% |
| ○ Written: 20% | |
| ○ Presentation: 5% | |

### Class Participation Grading Rubric

| | A – 90-100% Exemplary | B – 80-89% Proficient | C – 70-79% Developing | D – 60-69% Unacceptable | F – 0-59% Missing |
|---|---|---|---|---|---|
| **Frequency of class participation** | Actively contributes 2+ times per meeting | Actively contributes at least 1 time per meeting | Actively contributes at least half of the time during term | Actively contributes less than half of the time during term | Does not contribute |
| **Quality of class participation*** | Contribution is always thoughtful, accurate, and constructive, frequently interacting with peers | Contribution is mostly thoughtful, accurate, and constructive, usually interacting with peers | Contribution is somewhat thoughtful, accurate, and constructive, sometimes interacting with peers | Contribution is rarely thoughtful, accurate, and constructive, rarely interacting with peers | Does not contribute or interact with peers |
| **Level of class preparation** | Always fully prepared and on task | Mostly prepared and on task | Somewhat prepared and on task | Rarely prepared and on task | Consistently unprepared and not on task |

### Readings / Resources

ASML. (n.d.). *How microchips are made*. https://www.asml.com/en/technology/all-about-microchips/how-microchips-are-made

Baskaran, G., & Schwartz, M. (2024). *From mine to microchip: Addressing critical mineral supply chain risks in semiconductor production.* Center for Strategic and International Studies.

Begum, S., & Chowdary, F. (2024). Semiconductor product management life cycle. In *Competitive semiconductor product management: Navigating the future of semiconductor technology in the AI era* (pp. 37–60). Apress.

Berg, R. C., Ziemer, H., & Polo Anaya, E. (2024). *Mineral demands for resilient semiconductor supply chains: The role of the Western Hemisphere.* Center for Strategic and International Studies.

Bown, C. P., & Wang, D. (2024). Semiconductors and modern industrial policy. *Journal of Economic Perspectives*, 38(4), 81–110.

Brown, C., & Linden, G. (2009). *Chips and change: How crisis reshapes the semiconductor industry*. MIT Press.

Center for Strategic and International Studies. (2023). *Innovation lightbulb: Critical minerals and the U.S.-China chip war.*

Chien, C.-F., et al. (2011). Modelling and analysis of semiconductor manufacturing in a shrinking world: Challenges and successes. *European Journal of Industrial Engineering*, 5(3), 254–271.

CWRRR. (n.d.). *Can TSMC & Taiwan manage water to save global electronics?*

Donnelly, S. (2023). Semiconductor and ICT industrial policy in the US and EU: Geopolitical threat responses. *Politics and Governance*, 11(4), 129–139.

Hunt, W., Khan, S., & Peterson, D. (2021). *China's progress in semiconductor manufacturing equipment.* Center for Security and Emerging Technology.

Intel. (2020, February 18). *From sand to silicon: The making of a microchip* [Video]. YouTube. https://www.youtube.com/watch?v=_VMYPLXnd7E

Kollar, J. (2026). Fallowing the fields, feeding the fabs: Territorial restructuring and the political-industrial ecology of high-tech Taiwan. *Environment and Planning E: Nature and Space*, 9(2), 751–776.

Mathews, J. A. (1997). A silicon valley of the East: Creating Taiwan's semiconductor industry. *California Management Review*, 39(4), 26–54. https://doi.org/10.2307/41165909

Miller, C. (2022). *Chip war: The fight for the world's most critical technology*. Scribner.

Nishi, Y., & Doering, R. (Eds.). (2000). *Handbook of semiconductor manufacturing technology.* CRC Press.

Organisation for Economic Co-operation and Development. (2025). *Mapping the semiconductor value chain: Working towards identifying dependencies and vulnerabilities* (OECD Science, Technology and Industry Policy Papers No. 182). OECD Publishing. https://doi.org/10.1787/4154cdbf-en

Roussilhe, G., et al. (2024). From silicon shield to carbon lock-in? The environmental footprint of electronic components manufacturing in Taiwan (2015–2020). *Journal of Industrial Ecology.*

Semiconductor Industry Association. (2023). *2023 state of the U.S. semiconductor industry.*

Tsai, D. H. A. (2005). Knowledge spillovers and high-technology clustering: Evidence from Taiwan's Hsinchu Science-Based Industrial Park. *Contemporary Economic Policy*, 23(1), 116–128. https://doi.org/10.1093/cep/byi010

Tsai, S.-C., Lee, S.-H., & Chu, T.-J. (2024). On the tailor-made water governance mechanism for Taiwan's semiconductor industry. *Water Resources and Industry*, 31, Article 100252.

Tung, C.-Y. (Ed.). (2023). *Taiwan and the global semiconductor supply chain.* Taipei Representative Office in Singapore.

Wang, J.-C. (2023). *The U.S.-China technology war and Taiwan's semiconductor role in geopolitics.* The Hague Centre for Strategic Studies.

Wang, S.-C., Hsinchu Science Park Bureau, & contributors. (2020). *HSP40: Leader and pioneer of the world.* Hsinchu Science Park Bureau.

Xiao, H. (2012). *Introduction to semiconductor manufacturing technology* (2nd ed.). SPIE Press.

Zhang, N., & Kusters, J. (2025). *Product management for semiconductors: Strategies and solutions to drive growth.* Deloitte.

**Content**

Topic 1 – Taiwan's Semiconductor Transformation
- Taiwan's industrial history
- The role of state
- Hsinchu Science Park

Topic 2 – Chips, Power, and Geopolitics
- Brief history of Taiwan
- Contemporary cross strait relation and conflict
- China-US relation

Topic 3 – Mapping the Global Semiconductor Value Chain
- Global supply chain of semiconductor
- Key players and their interests

Topic 4 – From Minerals to Wafers: Materials Behind the Chip
- Mining silicon
- Smelting and crystallization
- Rare earth
- Chemicals and gases

Topic 5 – How Chips Are Made: A Conceptual Introduction
- IC design
- Slicing

Topic 6 – Inside the Fab: Yield, Quality, and Production
- Lithography and circuitry formation
- Packaging and testing

Topic 7 – Who Makes the Chip? People, Firms, and Product Management I
- Talent cultivation and education in Taiwan
- The basics of project management in the semiconductor industry
- Supporting and related industries

Topic 8 – Who Makes the Chip? People, Firms, and Product Management II
- Comparative case study of TSMC, Mediatek, UMC.

Topic 9 – The Price of the Chip: Capital, Resources, and Externalities
- The social and environmental costs of resource extraction
- Excessive use of electricity and water and its social cost
- The critique of uneven industrial development

Field study and experiential learning components may include:
- Taiwan Semiconductor Manufacturing Company (TSMC) Museum of Innovation
- National Taiwan Science Education Center

*Syllabus of Record is subject to minor changes in Term-specific Syllabus at faculty's discretion.*