

National Cheng Kung University
 Institute of Manufacturing Information and Systems
 Core Curriculum Plan for Master's Program

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The core courses aim to develop core capabilities in manufacturing information and systems.

一、 Information and Mechatronics (Group A)

Number of core courses:3

Course Name	Course Code	Department/ School	Instructor	Note
C# Programming Design	P953100	Institute of Manufacturing Information and Systems	Shang-Liang Chen	
Intelligent Machining	P962200	Institute of Manufacturing Information and Systems	Shang-Liang Chen	
Special Topics On Intelligent Machine	P962000	Institute of Manufacturing Information and Systems	Shang-Liang Chen	

Description:

1. C# Programming Design

<Course Overview> This course introduces the syntax of the C# Programming Language, ways to create programs that enable human-machine operation using Windows Forms controls, and the mechanisms for reading from, and writing to, a database through ADO.NET, to develop students' abilities to write programs.

<Objectives> Students will be able to learn how to analyze, design and use the C# Programming Language to write object-oriented programs, as well as to develop program structures and methods that are reusable, easy to maintain and expandable.

2. Computer-Aided Manufacturing

This course will provide students to learn the basic principle of machining and processing practices, and have basic knowledge of intelligent machining.

Through the IoT 4.0 technique, the basic sensor and programming on the development board can be used to penetrate into the IIoT communication. The application of the agreement and system integration solve the problem of industry 4.0 through implementation.

3. Special Topics On Intelligent Machine

The concept of using artificial intelligent into machinery to significant improve the machining performance or production efficiency is widely accepted by industry. The content of this course is then designed to have the following fundamental theories: 1. Industry 4.0 2. Artificial intelligent theory 3. AIoT theory 4. Deep learning theory 5. Theory of Raspberry Pi For improving the application ability, the use of Keras algorithm, Numpy coding library, OpenCV library will be included in the content of this course. Many case studies for solving the problem in real industry applications will also be introduced in the course.

二、 Manufacturing System and Management(Group B)

Number of core courses: 5

Course Name	Course Code	Department/ School	Instructor	Note
e-Manufacturing	P953200	Institute of Manufacturing Information and Systems	Fan-Tien Cheng	
Lean Enterprise Systems	P961000	Institute of Manufacturing Information and Systems	Taho Yang	
Computer-Integrated Manufacturing	N163900	Institute of Manufacturing Information and Systems	Rong-Shean Lee	
Intelligent Manufacturing Systems	P961400	Institute of Manufacturing Information and Systems	Chia-Yen Lee	
Scheduling Theory And Application	P970700	Institute of Manufacturing Information and Systems	Hung-Kai Wang	

Description:

- e-Manufacturing--- E-Manufacturing is advanced manufacturing that takes advantage of Internet and information technologies to efficiently integrate the Manufacturing Execution System (MES) and Equipment Engineering System (EES) within a company (intra-company integration), and the Supply Chain (SC) and Engineering Chain (EC) among member companies (inter-company integration). With e-Manufacturing, the productivity, yield, and overall equipment effectiveness (OEE) of the complete production platform can be improved, the cycles of time-to-market (T2M) and order-to-delivery (O2D) can be shortened; and further the goal of improving agility, efficiency, and decision-making for the entire semiconductor manufacturing processes can be reached.
- Lean Enterprise Systems ---Toyota Production System (TPS) is the exemplar of Lean Management. Its two pillars are: continuous improvement and respect for

people. TPS is originated from Toyota. It experienced oil crisis in 70s and yen appreciation in the past few decades but still remain profitable in the past 60 years continuously. It becomes well-recognized due to the publication of the book, “The machine that changed the world.” It has been proved to be the competitive advantage for manufacturing systems. Recently, it has been also successfully applied to the other industry sectors such as health care systems, service, government, etc.

- Intelligent Manufacturing Systems---This course will provide students to learn how to apply artificial intelligence (AI) and data science (DS) techniques to improve the efficiency of manufacturing systems. The models include genetic algorithm, neural network, feature selection, decision tree, etc. We need to read research literature to fill the gap between methodologies and practice. The course integrates the knowledge domains of the information and engineering, and solves the real problem systematically using the design of metaheuristic algorithms and statistics tools.
- Scheduling Theory And Application---This course will enable students to understand the basic theory of scheduling and its applications. The course content includes single-machine, multi-machine parallel machines, multi-machine non-parallel machines, job shop, flow shop and open shop scheduling in deterministic and stochastic scheduling; and also the commonly used dispatching rules and meta-heuristic algorithms, such as simulated annealing, tabu search, genetic algorithm and ant colony algorithm, etc. By writing the program for actual scheduling problems, students will have the ability to solve practical problems.

三、 Applied Information(Group C)

Number of core courses: 4

Course Name	Course Code	Department/ School	Instructor	Note
e-Manufacturing	P953200	Institute of Manufacturing Information and Systems	Fan-Tien Cheng	
Smart Business	P970600	Institute of Manufacturing Information and Systems	Yuh-Min Chen	
Database Management Systems And Practice	P953600	Institute of Manufacturing Information and Systems	Chao-Chun Chen	
Real-Time System	P953500	Institute of Manufacturing Information and Systems	Pei-Hsuan Tsai	

Description:

- e-Manufacturing--- E-Manufacturing is advanced manufacturing that takes advantage of Internet and information technologies to efficiently integrate the Manufacturing Execution System (MES) and Equipment Engineering System (EES) within a company (intra-company integration), and the Supply Chain (SC) and Engineering Chain (EC) among member companies (inter-company integration). With e-Manufacturing, the productivity, yield, and overall equipment effectiveness (OEE) of the complete production platform can be improved, the cycles of time-to-market (T2M) and order-to-delivery (O2D) can be shortened; and further the goal of improving agility, efficiency, and decision-making for the entire semiconductor manufacturing processes can be reached.
- Smart Business--- In this era of "where to use will leave the footprints", online and mobile data is full of the world, coupled with mobile computing, social media, networking, cloud, large data analysis and artificial intelligence and machine learning, contributes to the current "data science" era. As the data from the environment to the individual body cells, can be aware of, access, analysis, use, making the "smart economy" vigorous development. However, there are still

many challenges to the effective use of this large amount of data to help solve social problems and meet industry needs, which thus become the issues of the world government, academia, industry. The smart economy is not only the application of data analysis and artificial intelligence technology but also a business strategy and business model. In the practice of smart business, enterprises can carry out more effective business activities, management, problem solving and decision making, and even the development of new business models through understanding the current status and facts, realizing history evolution, predicting the future and preventing abnormalities, and improve and learning. In this course, Data Science and Artificial Intelligence are viewed as the application strategy and enabling technology for smart business. To meet the business needs, the concept of Smart is integrated into the thinking of organization and competition environment to provide students with the concepts, business models, implementation methodology, and enabling technology of smart business. Besides lectures, students are required to conduct individual study and team project to enhance their knowledge for strategic thinking, problem analysis, as well as solution development, implementation and evaluation of smart business.

- Database Management Systems And Practice--- This course is offered for those who are interested in understanding the design and implementation of database systems/applications for achieving the goal of building a customized computer-aided manufacturing systems and/or intelligent industrial automation and control systems. The main objective of this course is to study the fundamental concepts necessary for designing, using, and implementing database systems. In addition, students in this course also learn system implementation techniques, and will implement a system prototype in the end of the semester.
- Real-Time System---The real-time system requires to complete the planned work within a specified time or respond to the stimulus signals from the environment. The application range is quite wide, including embedded systems, multimedia, robots, wireless communication, industrial control, network routers, flight controller , Automobiles, electronic medical equipment, etc. This course will introduce related theories of real-time systems, including basic models, scheduling theories, resource allocation principles, multi-threaded programming, multi-processor scheduling, and real-time system application examples. Students will learn the operation principle of the real-time system and the ability to design real-time system software.