Module 5 Industrial Design Fundamentals

Contents

Module designation	*Foundation of Engineering Drawing*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Xi Chen*
Language	*Chinese*
Relation to curriculum	*Compulsory* *Engineering drawings are an important tool for expressing and communicating technical ideas, and are an important technical document for engineering and technology departments. The modern engineering graphics course studies the principles and methods of drawing and reading engineering drawings, and is a technical basic course, which is suitable for various majors of mechanical engineering and other majors with similar teaching requirements of mechanical majors. Cultivate students' ability to read and draw mechanical parts drawings and assembly drawings, as well as computer drawing skills.*
Teaching methods	*lecture, lesson, project, examination*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 120* *Contact hours:48 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:72*
Credit points	*4 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge:* *Be able to use mathematics, natural sciences, engineering foundations and professional knowledge to appropriately express complex engineering problems in the field of mechanical engineering.* *Master the fundamental knowledge of engineering graphics, understand the development history of graphics, and be familiar with the basic knowledge of projection theory.* *To develop students' strong ability to read and draw mechanical parts drawings and assembly drawings. Ability to develop, select and use appropriate technologies, resources, modern engineering*

	tools and information technology tools for complex mechanical engineering problems. *Skills:* *Able to use the basic knowledge of engineering graphics to properly formulate mechanical engineering problems.* *To develop students' hands-on and innovative skills.* *Ability to design solutions to complex mechanical engineering problems, mechanical systems, mechanical units (components) or machining processes that meet specific needs, and to demonstrate a sense of innovation in the design process.* *Be able to determine the design objectives according to the needs of users, and formulate solutions to complex engineering problems in the field of mechanical engineering.* *Be able to use CAD, CAM and simulation software to analyze and simulate the mechanical design and manufacturing process, and understand its limitations.* *Competence:* *Cultivate students' scientific thinking methods and enhance their engineering and innovation awareness. Conduct patriotic education for students during the teaching process of the development of graphics to strengthen national pride.* *To develop students' spatial thinking skills and the ability to solve spatial geometric problems.* *Able to apply the basic principles of engineering graphics to identify, express, and analyze mechanical engineering problems through literature research.* *Understand the technical standards and specifications, intellectual property rights, industry policies and laws and regulations, and safety management techniques related to mechanical engineering.*
Content	*I. Basic Knowledge of National Standard for Drawing and Basic Knowledge of Projection* *1. Basic Knowledge and Skills of Drawing* *a. Understand the development history of modern engineering graphics.* *b. Master the drawing methods and applications of various types of lines.*

	c. *Master the drawing methods of common geometric shapes (including regular polygons, ellipses, and the drawing methods of slopes and tapers).* d. *Master the drawing methods of arc connections.* e. *Master the drawing methods of plane figures.* *2. Basic Knowledge of Projection* a. *Basic concepts of projection.* b. *The formation process and projection characteristics of the projections of points, straight lines, and planes.* c. *The trace line representation of planes.* d. *The relative positions of two straight lines.* e. *The relative positions of two planes.* f. *The relative positions of straight lines and planes.* g. *Projections of solids.* *II. Projections of Composite Solids* *1. Three-view drawings.* *2. Drawing methods for composite solids.* *3. Reading methods for composite solids.* *4. Dimensioning of composite solids.* *III. Representation Methods for Machine Parts* *1. Axonometric projection.* *2. Views.* *3. Sectional views.* *4. Cross-sectional views.* *5. Local enlargement and simplified drawing methods.* *6. Introduction to third-angle projection.* *IV. Standard Parts and Common Parts* *1. Basic knowledge of threads, specified drawing methods, and marking methods.*

	2. Basic knowledge of threaded fasteners and assembly drawing methods. *3. Basic knowledge of gears.* *4. Basic knowledge of spur cylindrical gears, calculation of structural elements, and specified drawing methods.* *5. Basic knowledge of meshing gears, calculation of structural elements, and specified drawing methods.* *6. Basic knowledge of springs, key connections, and pin connections.*
Examination forms	*Paper Examination*
Study and examination requirements	*Pass the Paper Examination*
Reading list	[1] Tang Jueming, Xu Tenggang, Zhu Xiling. Modern Engineering Design Graphics [M]. Beijing: Tsinghua University Press, 2013. [2] Xu Tenggang, Xia Chaowen. Exercise Book for Modern Engineering Design Graphics [M]. Beijing: Tsinghua University Press, 2013. [3] Wu Hua, Li Fang. Modern Engineering Design Graphics [M]. Beijing: China Machine Press, 2018. [4] Hu Jiansheng. Engineering Drawing and AutoCAD [M]. Beijing: China Machine Press, 2021. [5] Zhai Yuanshang, Li Haiyuan, Zhu Wenbo. Mechanical Drawing [M]. Beijing: Higher Education Press, 2018.

Module designation	*Fundamentals of Manufacturing Technology A*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Zhangfan, Shi Xiaofan, Songfang*
Language	*Chinese*
Relation to curriculum	*Compulsory* *Through the study of this course, students can acquire the knowledge of common metal materials and their processing technology, and lay the necessary foundation for the subsequent*

	study of relevant courses and future work in the field of mechanical engineering or material processing engineering.
Teaching methods	*lecture, lesson, lab works, project.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 120* *Contact hours:48 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:72*
Credit points	*4 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*- Knowledge:* *Have the ability to involve and implement basic engineering experiments, and be able to analyze the experimental results.* *Learn about common materials used in manufacturing technical methods.* *- Skills:* *Master the basic knowledge of common manufacturing technology methods.* *Master the commonly used manufacturing technology methods.* *Master the requirements of the basic methods of manufacturing technology on the manufacturability of the part structure.* *- Competences:* *Have a correct understanding of lifelong learning, and have the ability to continuously learn and adapt to development.* *Be able to analyze complex engineering problems in the field of mechanical engineering with the help of literature research, seek a variety of solutions and be able to express them appropriately.* *Be able to evaluate the impact of the project in terms of social, health, safety, legal and cultural aspects, and be able to take reasonable means to reduce or avoid its adverse impacts.*

	Have the core concept of engineering ethics, understand mechanical engineers and their related professional norms, and have a sense of social responsibility.
Content	***Introduction*** *Classification of engineering materials* *Basics of heat treatment* ***Part 1 Liquid Metal Forming (Casting)*** *Alloy casting performance* *Commonly used alloy castings* *Commonly used alloy castings* *Introduction to special casting* ***Part 2 Metal Plastic Forming (Forging)*** *Plastic deformation of metals* *Open forging* *Enterprise production example: gear blank forging example* *Die forging* *Sheet metal stamping* ***Chapter 3 Metal Joining Forming (Welding)*** *Arc Welding Basics* *Common welding methods and applications* *Welding of commonly used metal materials* *Formulation of welding process regulations* Chapter 4 Metal Cutting *Metal Cutting Tools* *Metal cutting process and its physical phenomena* *Cutting technology economy* *Commonly used cutting processing methods* *Structural processability of parts*
Examination forms	*Oral presentation, examination*
Study and examination requirements	*60%Final exams, 20%attendance, 20%regular assignments*

Reading list	*1.Li Changhe , Yang Jianjun, Metal Processing (2nd Edition) [M], Science Press, 2020* *2.Wang Yingjie, Metal Processing (2nd Edition) [M], Mechanical Industry Press, 2021* *3.Song Jinhu, Fundamentals of Metallic Processing (2nd Edition) [M], Beijing University of Technology Press, 2021* *4.Zhang Shichang, Zhang Guanwei, Fundamentals of Mechanical Manufacturing Technology (4th Edition) [M], Higher Education Press, 2022* *5. Ni J.J., Principles and Processes of Metal Heat Treatment [M], Mechanical Industry Press, 2022 6. Kalpakjian S., SchmidS.R., Manufacturing Engineering and Technology (Seventh Edition) [M], China Machine Press, 2019* *6. Chen Yun, Peng Zhao. Metal Processing, Beijing: Machinery Industry Press, 2022*

Module designation	*Engineering Drawing and CAD*
Semester(s) in which the module is taught	*2*
Person responsible for the module	*Xiang Yang*
Language	*Chinese*
Relation to curriculum	*Compulsory* *"Engineering Drawing and CAD" is an important technical basic course for mechanical majors, and it is the basis for subsequent course design and graduation design in the entire curriculum system. The content includes three parts: part drawing, assembly drawing and computer drawing. Through the study of this course, we insist on cultivating people with virtue as the central link, which not only cultivates students' rigorous engineering awareness, but also cultivates patriotic feelings, realizes the whole process of education, all-round education, and cultivates talents useful to the society.*
Teaching methods	*lecture, lesson*

Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90* *Contact hours:32 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge:* *Be able to apply mathematics, natural sciences, engineering fundamentals and professional knowledge to appropriately formulate complex engineering problems in the field of mechanical engineering.* *Understand technical standards and specifications, intellectual property rights, industry policies and laws and regulations, and safety management techniques related to mechanical engineering.* *Skills:* *Be able to use CAD, CAM and simulation software to analyze and simulate the mechanical design and manufacturing process, and understand its limitations.* *Cultivate students' hands-on ability and innovation ability. Ability to develop solutions to complex mechanical engineering problems, design mechanical systems, mechanical units (components) or machining processes that meet specific needs, and be able to demonstrate a sense of innovation in the design process.* *Cultivate students' ability to read and draw mechanical parts drawings and assembly drawings. Ability to develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools for complex mechanical engineering problems.* *Competences: Cultivate students' scientific thinking methods and enhance their awareness of engineering and innovation. Ability to apply knowledge of engineering drawing to the appropriate formulation of mechanical engineering problems.* *Cultivate students' ability to imagine and solve spatial geometry problems. Able to apply the basic principles of engineering drawing*

	and literature reading research to identify, express and analyze mechanical engineering problems. *Be able to determine design objectives according to user needs and formulate solutions to complex engineering problems in the field of mechanical engineering.*
Content	***Chapter 1 Fundamentals** of **Limits and Coordination*** *Understand and preliminarily grasp the basic concepts of tolerance and fitting and marking methods.* ***Chapter 2 Parts Diagram*** *The role and content of part drawings, cultivate the ability to reasonably choose views to express the structure of parts, and master the methods of reading and drawing part drawings. The dimensioning on the part drawing is required to be correct, standardized, complete, clear and basically reasonable. Understand the technical requirements and meanings of marking on the part drawing, and master the annotation methods of surface roughness, dimensional tolerance and geometric tolerance. Learn about common part process structures.* ***Chapter 3 Assembly Drawings*** *The role and content of assembly drawings. Master the common expressions of assembly drawings and understand the view selection of assembly drawings. Master how to read and draw assembly drawings. Able to disassemble parts drawings from assembly drawings and assemble assembly drawings of components of medium complexity.* ***Chapter 4 Computer Graphics*** *The common functions of AutoCAD, operation methods, common 2D drawing, editing and annotation and other commands, according to the characteristics of computer drawing, be able to apply AutoCAD proficiently, and draw engineering drawings of medium complexity.*
Examination forms	*oral presentation, examination.*
Study and examination requirements	*40% Final exam, 30%Usual homework, 30%Computer Graphics Assessment*
Reading list	*1.Ying Hua,Zhou Yulan,Zang Yanhong,Yu Yunxia,Shan Ruixia. Practical tutorial for CAD software - AutoCAD, SolidWorks (3rd edition). Beijing:Beijing University of Posts and Telecommunications Press,2023.*

	2. Lv Zhipeng,Yang Yugen,Zhu Shimin. Modern Engineering Graphics (6th Edition). Beijing: Beijing University of Posts and Telecommunications Press, 2024. *3. Zhang Dongmei, Zhang Baoqing. Engineering Drawing & CAD (with workbook). Beijing: Science Press, 2019. 3. Hou Hongsheng, Yan Guan, Gu Yanhua. Mechanical Engineering Graphics (3rd ed.). Beijing: Science Press, 2022.*

Module designation	*Electrical Technology*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Zhongwei Zhang*
Language	*Chinese*
Relation to curriculum	*Compulsory*
Teaching methods	*lecture, lesson, lab works, project.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 120* *Contact hours:48 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:72*
Credit points	*4 ECTS CP*
Required and recommended prerequisites for joining the module	*University Physics A(I)(G219261), College Physics A(B)(G219262) , Advanced Mathematics (161250)*
Module objectives/intended learning outcomes	*Knowledge: Ability to apply relevant knowledge and mathematical modeling methods to deduce, analyze and design engineering problems in the field of electrotechnology* *Skills: Be able to apply the basic principles of mathematics, natural sciences and engineering sciences to identify, express and analyze complex engineering problems in the field of electrical technology through literature research to obtain effective conclusions.* *Ability to analyze circuits using the fundamental laws of circuits and fundamental analysis methods.*

	The ability to analyze and calculate the parameters and performance of single-phase sinusoidal AC circuits by using phasor analysis method. *The ability to analyze and calculate the parameters and performance of three-phase sinusoidal AC circuits.* *Be able to design solutions to complex engineering problems in the field of electrotechnology, design systems, units (components) or processes that meet the needs, and be able to reflect the sense of innovation in the design process, considering social, health, safety, legal, cultural and environmental factors.* *Ability to correctly express complex engineering problems based on relevant scientific principles and mathematical model methods* *Ability to identify and distinguish various types of transient processes, and to perform quantitative and qualitative calculations and qualitative analysis of transient processes in first-order linear circuits.* *Competences: Ability to apply mathematics, natural sciences, engineering fundamentals and professional knowledge to solve complex engineering problems in the field of electrotechnology.* *Ability to design units (components) for specific needs.* *The ability to properly select and use transformers based on engineering needs.* *The ability to correctly select and use an electric motor based on engineering needs.* *Ability to analyze and design relay contact control circuits.*
Content	*Chapter 1 Basic Concepts and Analysis Methods of Circuits* *The role and composition of the circuit and the state of the circuit* *Ideal circuit elements with reference point and reference direction in the circuit* *Kirchhoff's law* *Branch current method* *Junction voltage method* *Superposition theorem* *Equivalent power supply theorem* *Chapter 2 Sinusoidal AC Circuits* *The basic concept of sinusoidal alternating current* *Phasor notation of sinusoidal alternating current* *Single-parameter AC circuit*

	RLC series AC circuit *Impedance of series-parallel AC circuits* *The improvement of the power factor of the AC circuit* *Chapter 3 Three-Phase Sinusoidal AC Circuits* *Generation of three-phase electromotive force* *Analysis and calculation of three-phase circuits* *Three-phase power* *Chapter 4 Transient Process Analysis of First-Order Linear Circuits* *Changing Rules* *Zero-input response, zero-state response, and full-response of first-order circuits* *The three-element method of first-order circuits* *Chapter 5 Magnetic Circuits and Transformers* *The basic concepts and laws of magnetic circuits* *The basic electromagnetic relationship of AC core coil circuit* *The basic structure, working principle and application of transformer* *Chapter 6 AC Motors* *The structure and working principle of the three-phase asynchronous motor* *Nameplate data of three-phase asynchronous motor* *Chapter 7 Relay Contactor Control Circuits* *The structure and function of commonly used low-voltage electrical appliances* *The basic control circuit of the three-phase asynchronous motor*
Examination forms	*oral presentation, examination.*
Study and examination requirements	*70%Final exams, 10%attendance, 20%regular assignments*
Reading list	*1. Electrical Technology and Application, Zhixiong Zhang, Jingzhi Zhang, Lei Cui, Wei Zhang, et al., China Machine Press, 2020-06*

	2. *Shi Yikai. Electrotechnical technology[M]. Beijing: Higher Education Press, 2020.* 3. *Allan R.Hambley. Principles and applications of electrical engineering (7th edition) (English edition)[M]. Xiong Lan, trans. Beijing: Publishing House of Electronics Industry, 2019.* 4. *Wu Xueqin. Electrotechnics. (4th Edition) Beijing:Beijing Institute of Technology Press,2019* 5. *Tang Jie,Liu Yunhong. Electrotechnics. (4th Edition) Beijing:Higher Education Press,2014* 6. *Fan Xiaolan. Electrotechnical technology[M]. Beijing: Tsinghua University Press, 2014.*

Module designation	*Mechanics of Materials*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Yongxia Wu*
Language	*Chinese*
Relation to curriculum	*Compulsory* *Mechanics of materials is a science that studies the mechanical properties of engineering materials and the calculation theory of strength, stiffness and stability of components, and is one of the most important professional basic courses in engineering undergraduate teaching. The knowledge and theories of this course can not only be directly applied to engineering practice, but also lay the necessary theoretical foundation for subsequent related courses, through which students can model, analyze, calculate and evaluate solutions to complex engineering problems, and cultivate students' engineering awareness, innovation consciousness and high sense of social responsibility.*
Teaching methods	*lecture, lesson, lab works.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 120* *Contact hours:48 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:72*
Credit points	*4 ECTS CP*

Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Establish a simplified mechanical calculation model of various components in the mechanical structure, master the basic principles and methods of studying the distribution law of internal force, stress and deformation of rods, and be familiar with the calculation of the strength and stiffness of components under various basic deformations.* *Be able to apply the relevant knowledge and mathematical model methods of the major to deduce and analyze complex engineering problems in the field of mechanical engineering.* *Skills: Master the concept of stress state at a point, the commonly used strength theory, the concept of stability and the calculation method of pressure bar stability. Proficient in the analysis and design methods for the reliable use of components under combined deformation.* *Learn to operate experimental equipment and instruments to test the mechanical properties of materials, and be able to characterize stress-strain curves, and have certain experimental analysis capabilities.* *Be able to apply the basic principles of engineering science to analyze the key links and main parameters of complex engineering problems in the field of mechanical engineering.* *Competences: Cultivate students' ability to apply course knowledge and engineering awareness, and propose solutions to complex problems in mechanical engineering. Improve students' teamwork ability, awareness of independent learning and innovative spirit.* *Be able to conduct research and experimental verification of physical phenomena and material properties related to mechanical engineering.*
Content	***1.Introduction*** *the task and research object of material mechanics; basic assumptions of the mechanics of materials; external and internal forces; stress and strain; The basic form of member deformation.* ***2. Axial tension and compression and mechanical properties of materials*** *Introduction; internal forces and stresses of tension and compression rods; mechanical properties of materials in tension and compression; Calculation of the strength of the tension and*

	compression rod; failure and allowable stress; Deformation calculation of tension and compression rods; Simple tension and compression static indefiniteness; Strength calculation of connectors. ***3 Shear and squeeze*** *the concept of shear and extrusion, shear surface and extrusion surface area, shear stress, extrusion stress, strength calculation of connectors, nominal stress calculation of shear and extrusion.* ***4 Torsion*** *Introduction; torsional torque, torque, and torque diagrams; Torsional test of thin-walled cylinders and shear Hooke's law; stress and deformation of torsion of circular shafts; Strength and stiffness conditions during torsion of a circular shaft.* ***5. Plane bending of beams*** *Schematic diagram of the calculation of the beam; Bending internal forces and internal force diagrams; Shear force diagram and bending moment diagram; Differential relationship between shear force, bending moment, and load concentration. bending normal stress; bending shear stress of a rectangular cross-section beam; Comparison of bending normal stress and bending shear stress; bending normal stress strength conditions; bending shear stress strength conditions; The main measures to improve the bending strength of the beam. the integral method for determining the displacement of beams; approximate differential equations for deflection curves; superposition method for determining beam displacements; Stiffness conditions and reasonable design of beams; Simple static indefinite beam.* ***6 Theory of Stress States and Strength*** *Introduction; Analytical method for plane stress state analysis; Geometric method for plane stress state analysis - stress circle; stress in the three-way stress state; Generalized Hooke's Law; strain energy and distortion energy under complex stress conditions; An overview of the theory of intensity.* *7* ***Combined deformation*** *Combined deformation of tension (compression) and bending; The members are subjected to both transverse and axial forces; eccentric tension (compression) section core; a combination of bending and torsion; Calculation of the strength of the shaft when the combined bending and torsion are deformed; Calculation of the strength of the shaft when bending in both directions.* ***8 Stable pressure rod***

	critical load of slender pressure rods; the critical load of the hinged slender pressure rod at both ends; Critical load of non-hinged slender pressure rods at both ends; the general form of Euler's formula; the critical stress of the compression rod; Stable conditions and reasonable design of the pressure rod.
Examination forms	*oral presentation, examination.*
Study and examination requirements	*60%Final exams, 20%attendance, 20%regular assignments*
Reading list	*1.Zhang Gongxue,Li Jianjun. Mechanics of Materials (3rd Edition)[M]. Xidian University Press, 2022.* *2.Zhang Gongxue. Mechanics of Materials(Second Edition)[M].Xidian University Press, 2016.* *3. Liu Hongwen. Mechanics of Materials (6th Edition)[M]. Higher Education Press, 2017.* *4. Yin Yajun, Fan Qinshan. Mechanics of Materials (3rd Edition)[M]. Higher Education Press, 2019.* *5. James M. Gere, Mechanics of Materials (English Edition, Original Book 7th Edition) (Strength of Materials) [M].China Machine Press, 2019.*

Module designation	*Material and Technology*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Ziran Zhang*
Language	*Chinese*
Relation to curriculum	*Elective* *Through the study of this course, students can have the basic knowledge of peripheral disciplines required for engaging in industrial design, master the theoretical basic knowledge of professional fields, have professional skills such as design expression ability and innovation ability, and be familiar with intellectual property regulations, safety and environmental protection policies related to industrial design.*
Teaching methods	*lecture, lesson, lab works, project, seminar.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90*

	Contact hours:32 including lecture, exercise, and test. *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Master the concept of product design materials and processes, understand the industrial production and processing process of various products of different materials, and recognize the importance of CMF and its practical application* *Master the design methodology of color, material and process through practical operation, deepen the process and method of CMF-related design theory in product design.* *Skill: Cultivate students' rigorous academic attitude, the ability to make models, and comprehensively grasp the characteristics of various materials and their basic technological processes* *Have the ability to improve or innovate product CMF* *Master the relevant theoretical knowledge of materials and processes, and have the ability to analyze the key technical indicators and technical realization of products* *On the basis of analyzing product CFM, through innovative thinking and the application of various materials, we can propose product design CFM-related improvement or innovative design capabilities for design schemes* *Competences: Have a good sense of teamwork and innovative spirit, establish the correct core values of socialism, consciously inherit and carry forward the excellent traditional Chinese culture, improve the aesthetic and humanistic qualities, and further enhance cultural self-confidence.* *Combined with practical problems, we can have the ability to comprehensively apply the theoretical knowledge related to product CMF design, and propose corresponding design solutions for the color, material and process of the overall product and each detail*
Content	*Chapter 1 Product Innovation Design* *Innovation* *Classification of product innovation design* *The significance of product innovation design*

	Chapter 2 CMF Design *1.CMF professional analysis* *2. Design elements of CMF* *3. CMF's design process* *Chapter 3 Timber* *1.Red cedar* *2. Oak* *3. Douglas fir* *4. Beech* *5. Walnut* *6. Birch* *7. Teak* *8. Maple* *Chapter 4 Metals* *1.Steel* *2. Stainless steel* *3. Aluminum* *4. Aluminum alloy* *5. Copper* *6. Brass bronze* *7. Zinc* *8. Magnesium* *9. Silver* *10. Titanium* *11. Tin* *Chapter 5 Plastics* *1.ABS plastic* *2. Polyurethane* *3. Polyethylene* *4. Silicone* *5. Nylon* *6. Plexiglass* *7. Polypropylene* *8. Polyvinyl chloride* *9. Cellulose acetate* *10. Thermoplastic elastomers*

	11. Polyethylene terephthalate / 205 polycarbonate *Chapter 6 Ceramics* *1.Stoneware* *2. Terracotta* *3. Fine pottery* *4. Porcelain* *5. Bone china* *6. Nano zirconia ceramic* *Chapter 7 Other Materials* *1. Leather* *2. Bark* *3. Mycelium* *4. High borosilicate glass* *5. Crystal glass* *Theoretical Application and Design Practice I* *Theoretical Application and Design Practice II*
Examination forms	*oral presentation, project presentation.*
Study and examination requirements	*60%Final exams, 10%attendance, 30%regular assignments*
Reading list	*Tang Kaijun. Materials and technology of product design[M]. China Light Industry Press, 2020.* *Li Jin, "Product Design Materials and Processes", Tsinghua University Press, 2018.05* *He Songlin , "Product Design Materials and Processing Technology", Electronic Industry Press, 2020.04* *Jiang Bin, "Creative Product CMF (Color, Materials and Processes) Design", Electronic Industry Press, 2019.10*

Module designation	*Basic Drawing*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Jianguo Zhan*
Language	*Chinese*
Relation to curriculum	*Elective*

	This course is a basic art course for non-art students majoring in industrial design in the College of Art and Design, aiming to enable students to master the basic drawing ability to meet the needs of professional teaching in the future through a period of intensive training.
Teaching methods	*e.g. lecture, lesson, lab works, project, seminar etc.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90* *Contact hours:32 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Understand and master the basic principles of perspective, Acquire basic color knowledge.* *Skills: Ability to analyze and summarize the physical characteristics of the depicted object. Able to apply basic principles to identify and express industrial design processes and methods.* *Competences: The ability to design expression with the help of color.*
Content	***1.****Correct way of seeing and basic rules of perspective* *Introduce concepts such as "drawing", "structure", and "perspective", and learn how to use painting tools correctly to observe and view the depicted objects.* *2.Induction and modeling training of morphology* *Summarize and summarize the modeling characteristics of the object, and train to unify observation and depiction.* *3.Knowledge of color principles* *The basic concepts of color (hue, saturation, lightness, primary colors, intermediate colors, complementary colors, etc.); Observe and feel the subtle color changes of the depicted object; Correct restoration of the colors seen in the view; Familiar with the mixing and blending of colors;* *4.Grasp the color tone* *Master the combination and use of different shades.*
Examination forms	*oral presentation, sktching.*

Study and examination requirements	70%Big Assignment, 20% Usual homework, 10%Attendance.
Reading list	*Design Sketch (Third Edition) Zhou Xiaojuan, Wang Lianying, Peng Ze, Li Xin (Authors) Publisher: Huazhong University of Science and Technology Press; Version 1 (July 2019)* *"The Twelfth Five-Year Plan Textbook Series of Chinese Colleges and Universities: Color Basics" Li Feng, Deng Linghong, Deng Houping (Authors), Publisher: China Youth Press; 1st Edition (July 2012)* *"Design Color (Textbook of the Twelfth Five-Year Plan for Art and Design in National Colleges and Universities)" Qiao Lei, Cai Yingjun (Editor) Publisher: China Light Industry Press; 1st Edition (July 1, 2017)* *Design Sketch (2nd Edition) Series of Textbooks for Industrial Design in Higher Education Han Fengyuan (Author), Publisher: China Architecture & Building Press; Version 1 (November 2009)*

Module designation	*The History of Industrial Design*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Chao Zheng*
Language	*Chinese*
Relation to curriculum	*Elective* *The history of industrial design is the basic theoretical course of industrial design in colleges and universities, the core course of cultivating students' professional theoretical literacy, and the course of design history and evaluation, the background of the times and style schools, regional culture and personality characteristics. Learning this course well is the most basic theoretical cultivation requirement for students majoring in industrial design.*
Teaching methods	*lecture, lesson, seminar.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 60* *Contact hours:16 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:44*

Credit points	*2 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge:* *Learn about the history of industrial design* *Learn about industrial design in different cultural contexts* *Skills:* *Master the main genres and styles of industrial design* *Master the basic theories and skills required for art and design work, and have the basic qualities and correct concepts for art and design work; Master basic drawing and computer-aided design skills;* *Competences:* *Possess basic artistic knowledge and aesthetic accomplishment; Master the knowledge of Eastern and Western clothing culture, understand Chinese traditional culture and art forms, establish cultural self-confidence, and be able to construct a positive cultural and artistic outlook through comparative analysis.*
Content	*Chapter 1 Design before the Industrial Revolution* *1.The germination stage of design, 2. The generation of design concept, 3. The stage of handicraft design, 4. The handicraft design of China, 5. The handicraft design of foreign countries* *Chapter 2: Design and Commerce in the 18th Century* *1.The expansion of the market and its need for design2.The division of labor and the emergence of the design profession3.The design style of the 18th century4.Chepdale and the furniture industry of the 18th century5.Weidwood and the ceramics industry6.Paulton and his small hardware industry7.Design under new conditions* *Chapter 3 Mechanization and Design Reform* *1.Mechanization and design2.Textile industry in the United Kingdom3.Technology and design4.Manufacturing system and design in the United States5.Early automobile design in the United States6.Standardization and rationalization* *Chapter 4 The Development of Industrial Design in the 20th Century* *1.Industry and Design in the United States, 2.Industry and Design in Europe, 3.Craftsmanship and Design in Scandinavian Countries,*

	4.New Materials and Modern Design, 5.Technology and Design, 6.Artistic Change and Modern Design
Examination forms	*oral presentation, essay.*
Study and examination requirements	*50%essay, 30% Usual performance, 20%Attendance*
Reading list	*1.Wang Chensheng, History of Industrial Design, Shanghai Fine Arts Publishing House, 2022* *2.He Renke, History of Industrial Design, Higher Education Press, 2022*

Module designation	*The Basis of Composition Design*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Ting Zhang*
Language	*Chinese*
Relation to curriculum	*Elective* *This course is a basic course that will enable students to apply the basic concepts of aesthetics and art sciences to the appropriate formulation of design problems, and to seek reasonable solutions and improve them.*
Teaching methods	*lecture, lesson, lab works, project, seminar.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90* *Contact hours:32 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge:* *understanding of the basic elements of color construction and expressive thinking.* *understanding of the basic elements of plane graphic construction and expressive thinking.*

	Skills: *cognitive and practical abilities for formal beauty phenomena such as repetition, approximation, gradation, emission, variation, density, contrast, and texture.* *Competences:Cultivate students to systematically learn composition design, be good at communication and cooperation, be good at learning, have an independent personality, self-confidence and perseverance, and have the courage to take responsibility, and have a more standard and international design concept.* *Cultivate students' mastery of the basic knowledge of compositional design, and learn to have a critical spirit, creative thinking, and aesthetic literacy of modern design talents.*
Content	*Chapter 1: Plane Components* *1.1 Composition of point elements in plane graphics* *1.2 Composition of planar graphic line elements* *1.3 Composition of plane graphics and surface elements* *1.4 Plane graphics, points, lines, and surfaces are composed of comprehensive elements* *Chapter 2: Color Components* *2.1 Matching of hues in the three elements of color* *2.2 Brightness collocation in the three elements of color* *2.3 Purity matching in the three elements of color* *2.4 The contrast and harmony relationship between hue, brightness and purity in the three elements of color* *Chapter 3 The Beauty of Form* *3.1 Repeats* *3.2 Approximation* *3.3 Gradients* *3.4 Launch* *3.5 Variation* *3.6 Intensive* *3.7 Comparison* *3.8 Texture*
Examination forms	*Oral presentation, project.*

Study and examination requirements	*60%project work, 30% Usual performance, 10%Attendance*
Reading list	*1.Xiao Yong.Plane Composition.Beijing:Beijing Institute of Technology Press,2019* *2.Cheng Zhaohui,Plane Composition,Zhejiang,China Academy of Art Press,2019* *3.Li Jing. Color composition. Beijing: China Youth Publishing House, 2013* *4. Yu Guorui,Color composition,Tsinghua University Press, 2019.6* *5. Gong Zunmin, Three-dimensional composition, China Light Industry Press, 2018.6* *6.Huang Yi, Wu Huayu. Forming the basis of the design. China Light Industry Press.2019.05*

Module designation	*Computer Aided Industrial Design (I)*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Peihao Tong*
Language	*Chinese*
Relation to curriculum	*Elective* *This course is the basic course of industrial design for undergraduates, and the main task is to cultivate students' ability to think globally and "craftsman spirit", keep pace with the times, and use computer technology to realize industrial design solutions.*
Teaching methods	*lecture, lesson, seminar.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90* *Contact hours:32 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*

Module objectives/intended learning outcomes	*Knowledge:* *The knowledge of* PHOTOSHOP AND ILLUSTRATOR *Skills:* *The quality of proficient use of design software to realize the design scheme, and the ability to combine the two plane software with the three-dimensional modeling software to realize the design scheme.* *Proficient in the use of software, artistic and scientific processing of industrial design, with a certain creative thinking.* *Competences:* *Cultivate students' ability to think about and solve problems from a global perspective. It is necessary to have the awareness of keeping pace with the times, to apply cutting-edge technology to industrial design, to become professional and technical talents in the new era, and to have an international vision.* *The "craftsman spirit" is the main line throughout the whole teaching process, meticulous and excellence.*
Content	***Chapter 1 Introduction*** *AN OVERVIEW OF THE BASIC OVERVIEW, NATURE AND CHARACTERISTICS OF PHOTOSHOP AND ILLUSTRATOR SOFTWARE, THE WAY TO USE IT AND THE WAY TO USE IT TOGETHER.* ***Chapter 2 Photoshop I*** *Introduce the use of PS software toolbar, menu, and channel; Brush Tools & Erasers, Healing Tools, Free Transforms, Color & Pattern Fills, Advanced Layer Knowledge, Channel & Mask Basics, Pen Tools, and general practical examples.* ***Chapter 3 Photoshop II*** *word processing tools, batch processing, other tools, brightness and levels, curves and color balance, beginner/advanced cutouts, blending modes, filters, and general practical examples.* ***Chapter 4 Illustrator I*** *Introduce the use of AI software interface, toolbar, menu, basic graphics, graphic coloring, graphic transformation, graphic synthesis, and comprehensive operational common example guidance.* ***Chapter 5 Illustrator II*** *Quick Selection, AI Layer Management, Alignment and Distribution, Guides and Grids, Strokes and Swatches, Pencils and*

	Brushes, Line Art Coloring, Pen Tools, and General Practical Example Guidance.
Examination forms	*oral presentation, design project.*
Study and examination requirements	*60%Final assessment,30%Usual homework,10%Attendance*
Reading list	*[1] Li Jinming, Li Finance. Photoshop 2023 Introductory Tutorial[M].Beijing:People's Posts and Telecommunications Press,2023.* *[2] Mizuki Jushi. Photoshop+Illustrator Graphic Design Tutorial[M].Beijing:People's Posts and Telecommunications Press,2020.* *[3] Zhang Xiangquan, Lin Xingmin, Wang Jun, Zhao Ruotie. Pan Rong Computer-Aided Industrial Design[M].Beijing:China Architecture & Building Press,2019.* *[4]Illustrator from Beginner to Mastery, Yunfei, China Business Press, 2021-01; Photoshop from Beginner to Mastery, Yunfei, China Business Press, 2021-01*

Module designation	*Computer Aided Industrial Design (II)*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Ziqiang Wang*
Language	*Chinese*
Relation to curriculum	*Elective* *This course is the basic course of the industrial design major, and it is also one of the platform courses of the industrial design major. Through the study of this course, students can master the comprehensive ability of 3D software-aided industrial design.*
Teaching methods	*lecture, lesson, project, seminar.*
Workload (incl. contact hours, self-study hours)	*Total workload:90* *Contact hours:32 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*

Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge:* *Master the important design methods and related theoretical knowledge of industrial design disciplines.* *Skills:* *learn and apply computer-aided industrial design software (three-dimensional), and require students to independently use computer-aided industrial design software (three-dimensional) to carry out industrial design activities in industrial design practice.* *Competences:* *Students will be able to independently establish and convert digital models, and at the same time be able to complete the digital effect performance of virtual three-dimensional models.* *Strengthen students' understanding of the role of industrial design in promoting China's economic development, enhance the role of computer-aided industrial design, and enhance students' ability and determination to master computer-aided design.*
Content	*Chapter 1 Introduction to the Computer-Aided Design Rhino Course* *Introduction to the Computer-Aided Design Rhino course* *Chapter 2 Computer-Aided Design Rhino Operation Interface Explained* *Computer-aided design of the Rhino user interface* *Chapter 3 Computer-Aided Design Rhino Tool Commands Explained* *Computer-aided design of Rhino tool commands.* *Chapter 4 Computer-Aided Design Rhino Modeling Ideas Explained* *Computer-aided design Rhino modeling ideas explained.* *Chapter 5 Computer-Aided Design Rhino Case Practice* *Computer Aided Design Rhino case practice.* *Chapter 6 Virtual 3D Model Rendering* *Virtual 3D model rendering.*
Examination forms	*oral presentation, design project.*

Study and examination requirements	*60%Final assessment,30%Usual homework,10%Attendance*
Reading list	*1. Zhong Shihuang, New Impression Rhino + KeyShot Product Modeling Design Essence, People's Posts and Telecommunications Press, 2021, ISBN: 9787115515773* *2. Guo Jialin, Huang Longda, One Line Modeling: Rhino Product Modeling Advanced Tutorial, People's Posts and Telecommunications Press, 2018.9, ISBN: 9787115484123* *3. Huang Shaogang, Rhino 3D Industrial Modeling and Design, Tsinghua University Press, 2011.1, ISBN: 9787302241041* *4.Yao Yiming, Chinese Edition of Rhino 7 Complete Self-study Course, People's Posts and Telecommunications Press, 2022.8, ISBN: 9787115583673*

Module designation	*Mechanisms and Machine Theory*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Chao Zhang*
Language	*Chinese*
Relation to curriculum	*Elective* *Mechanical Principles and Parts is a technical basic course that introduces the working principles, structural characteristics, basic design theories and calculation methods of common mechanisms and general parts of general machinery. It has the role of enhancing students' adaptability to mechanical technology work and developing and creative ability in cultivating senior engineering and technical talents.*
Teaching methods	*lecture, lesson, lab works, project, seminar.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload:150* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 64* *Private study 86,including examination preparation, specified in hours*
Credit points	*5ECTS CP*

Required and recommended prerequisites for joining the module	*Prerequisites: Mechanical Drawing (070528), Mechanical Manufacturing Technology (163016)*
Module objectives/intended learning outcomes	*Knowledge:* *Basic knowledge and ability to perform structural analysis, motion analysis and dynamic analysis of general planar mechanisms. Ability to query technical data, calculations, drawings, and have basic knowledge of analyzing and designing institutions according to known dynamic conditions.* *Skills:* *Proficient in the characteristics, working principles and design methods of general mechanical parts, and be able to design general mechanical products.* *To be proficient in basic design methods and calculations in mechanical engineering; Able to study and analyze the influence of structure, material and other parameters on the performance of parts, strong experimental ability.* *Be able to apply the basic principles of engineering science to analyze the key links and main parameters of complex mechanical engineering problems.* *Competences: Students should have strong self-learning ability and problem analysis ability, innovative spirit, engineering awareness, teamwork spirit, and strong patriotism.* *Be able to formulate corresponding experimental plans for mechanical systems, devices and structures based on scientific principles and scientific methods.*
Content	*Chapter 1 Introduction* *This chapter needs to clarify the research object and content of the curriculum, and the role and status of the curriculum in the teaching plan. Combined with typical examples, the concept of machinery, machines, mechanisms, components and parts is introduced, and the basic requirements that should be met when designing machines are briefly described, as well as the basic guidelines and material selection principles for mechanical parts that should be followed when designing mechanical parts.* *Understand the basic requirements and general procedures of mechanical design and the common materials used for mechanical parts.* *Chapter 2 Analysis of the Degree of Freedom and Speed of Plane Mechanism*

	The composition of the mechanism, the drawing of the simple diagram of the motion of the mechanism, the conditions under which the mechanism has to determine the motion, and the calculation of the degree of freedom of the mechanism. The concept of velocity transient center and the determination of its position, the velocity transient method is used for the velocity analysis of the mechanism. *Chapter 3 Plane Connecting Rods* *The characteristics and application of the planar linkage, the basic type and evolution of the planar linkage, the basic characteristics of the planar linkage, and the design of the planar linkage.* *Chapter 4 Cam Mechanism* *applications and types of cam mechanisms; common motion laws of followers; pressure angle of the cam mechanism; Diagram method to design the cam profile.* *Chapter 5 Gear Mechanism* *characteristics and types of gear mechanisms; basic law of tooth profile meshing; the formation of involutes and their characteristics; meshing characteristics of involute tooth profiles; Basic parameters and geometric dimensions of involute standard gears; the transmission properties of involute spur cylindrical gears; Correction reason, cutting method, geometric size, transmission type and design step of displacement gear; Meshing characteristics, basic parameters and geometric dimensions of helical cylindrical gear transmission.* *Chapter 6 Wheel System* *classification and application of gear trains; Calculation of fixed shaft gear train transmission ratio; Calculation of the transmission ratio of the rotating gear train and the mixed gear train.* *Chapter 7 Connections* *Thread strength calculation to improve fatigue strength, material and allowable stress* *Chapter 8 Gearing* *Classification of gear transmission; tooth failure; commonly used materials; design guidelines; Tooth force analysis (straight, helical cylindrical gear transmission); Calculation of bending fatigue strength of tooth root and tooth surface contact fatigue strength of straight and helical cylindrical gear transmission; allowable stress of gears; gear structure design; Introduction to Gear Transmission Lubrication.* *Chapter 9 Worm Drive* *Classification of worm drives; Ordinary worm transmission parameters; Lapse; commonly used materials; design guidelines;*

	Calculation of transmission strength of ordinary cylindrical worm and its efficiency. *Chapter 10 Belt Drive* *Composition and classification, failure and design criteria, design calculations, stress composition and classification of belts, elastic sliding, design of pulley structures.* *Chapter 11 Axis* *Functions and classification, materials, strength calculations of shafts and structural design (including couplings).* *Chapter 12 Bearings* *Knowledge of the main types, constructions (with emphasis on radial plain bearings) and common materials of plain bearings;*
Examination forms	*oral presentation, lab report, examination .*
Study and examination requirements	*70% Final exam, 30% Usual performance,*
Reading list	*1. Pu Lianggui, Ji Minggang et al., Mechanical Design (10th Edition), Higher Education Press, 2019* *2. Sun Zhili, Ma Xingguo, Huang Qiubo, et al., Mechanical Design, Science Press, 2008* *3. Qiu Xuanhuai, Guo Keqian, Wu Zongze, Mechanical Design (Fourth Edition), Higher Education Press, 1997* *4. Liu Ying, Wu Zongze, Mechanical Design Course (Second Edition), China Machine Press, 2008* *5.Yang Kezhen, Cheng Guangyun, Fundamentals of Mechanical Design (7th Edition), Higher Education Press, 2020 Sha Ling. Basic experimental guidance for mechanical design. Tsinghua University Press, 2009*

Module designation	*The Processes and Methods of Industrial Design*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Qi Li*
Language	*Chinese*
Relation to curriculum	*Elective* *Through the study of this course, students can have the basic knowledge of peripheral disciplines required to engage in industrial design, master the theoretical basic knowledge of the professional field, have the professional skills such as design expression ability*

	and innovation ability, and have the ability to analyze market trends and consumer psychology.
Teaching methods	*lecture, lesson, lab works, project, seminar.*
Workload (incl. contact hours, self-study hours)	*Total workload:90* *Contact hours:32 including lecture, exercise.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: awareness of the value of designing procedures and methods, understanding of the development of design procedures and methods.* *Skills: master the process of designing procedures and methods for commercial application, master the norms of design procedures and methods.* *Competences:* *Master the development trend of design procedures and methods.* *On the basis of analyzing products, through innovative thinking and the application of various materials, we can propose new design solutions for new design solutions.*
Content	*Chapter 1 Introduction* *Section 1 Thinking and Methods* *Section 2 The Difference Between General Thinking and Design Thinking* *Section 3 Differences between general methods and design methods* *Section 4 Understanding Design Thinking and Design Methods* *Section 5 Design Research* *Chapter 2 Basic Procedures for Industrial Product Design* *Section 1 Overview of Basic Procedures* *Section 2 Acceptance of Projects (Acceptance of Projects, Formulation of Plans)*

	Section 3 Design Research Stage (Design Research, Problem Search) *Section 4 Design Preparation Phase (Design Preparation, Problem Analysis, User-Centered Product Development)* *Section 5 Solution Design Stage (Design Scheme, Problem Solving, Product Definition and Formation)* *Section 6 Design product production stage (design and production, improve the plan)* *Section 7 Product Market Operation (Marketing, Commercial Operation)* *Chapter 3 Industrial Design Research Methods and Product Development Process* *Section 1 Design Research* *Section 2 Design Research and Analysis* *Section 3 Design Decisions* *Chapter 4 Design Methodology* *Section 1 Technology Predictive Design Method* *Section 2: Scientific Analogical Design Method* *Section 3 System Analysis and Design Method* *Section 4: Creative Design Law* *Section 5 Logical and Anti-Logical Design Methods* *Section 6: Information Analysis and Design Methods* *Section 7 Similar Design Method* *Section 8 Simulation Design Method* *Section 9 Biomimetic Design Method* *Section 10 Optimization Design Method* *Section 11 Reliability Design Method* *Section 12 Dynamic Analysis and Design Method* *Section 13 Fuzzy Design Method* *Section 14 Value Target Design Method* *Chapter 5 Design Expression* *Through practice, students have in-depth discussions on the design opportunities encountered in the design research, deepen*

	the design scheme, and share it in the form of oral presentation, and the teacher will comment and analyze the design scheme
Examination forms	*oral presentation, final design project.*
Study and examination requirements	*60%Final exams, 30%regular assignments, 10%attendance.*
Reading list	*[1] Vogel, Xin Xiangyang, Pan Long. Creating breakthrough products [M]. China Machine Press, 2004* *[2] Chengnan. Design thinking and methodology[M]. Hubei Changjiang Publishing House, 2009* *[3] Lu Xiaobiao. Design thinking and methods[M].Jiangsu Fine Arts Publishing House,2013* *[4] Chen Lixun. The Tension of Design: Design Thinking and Methodology[M]. China Architecture & Building Press,2012* *[5] Kristin Fontichiaro. Design Thinking [M]. Cherry Lake Publishing,2015* *[6] Zhangtong, Zhangziran. Design procedures and methods [M]. Shanghai Jiao Tong University Press, 2012* *[7] Su Ke. Product design procedures and methods[M]. China Light Industry Press, 2022*

Module designation	*Creative Thinking Training and Expression*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Mingjie Zhu*
Language	*Chinese*
Relation to curriculum	*Elective* *This course integrates the principles of creative and innovative thinking, creative thinking methods and the application and practice of methods in an orderly manner, from understanding, acceptance, application to elimination to form a systematic curriculum system of creative thinking methods. The focus is on effectively improving students' creative thinking and expression skills. The methodology is described in detail, and the course training helps students master the method of developing creative thinking. It is of great significance to nurture the innovative awareness and ability of design/non-design students.*

Teaching methods	*lecture, lesson, lab works, project, seminar.*
Workload (incl. contact hours, self-study hours)	*Total workload:90* *Contact hours:32 including lecture, exercise.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Cultivate students' spirit of exploration and innovationSkills: To help students understand and master the theories, presentation methods and skills related to creative thinking* *Competences: Students are guided to use creative thinking methods to come up with innovative solutions* *Develop students' teamwork skills and build leadership skills* *Ability to effectively communicate and exchange with industry peers and the public on complex industrial design issues, including writing reports,* *Ability to communicate and communicate in a cross-cultural context.*
Content	*Chapter 1 Introduction to the Curriculum* *Functions and requirements of this course* *Two modes of thinking: fixed thinking and creative thinking* *Break the stereotype* *The use of thinking patterns* *Chapter 2 Creative Thinking Methods* *2.1 Associative stimulation* *2.2 Group Ideas* *2.3 Information Epiphany* *2.4 Information Combination Method* *2.5 Analogy fits the law* *2.6 Idea Collection* *2.7 Morphological Creativity Method* *Chapter 3 Application of Creative Methods* *3.1 Mapping cases* *3.2 Mind Mapping Case* *3.3 Law 635 cases* *3.4 Information Law Cases* *3.5 Purpose: Idea case* *3.6 Quadrant analysis examples*

	3.7 KJ Law Case *3.8 NM Case* *3.9 Cases of the 7x7 method* *3.10 Cases of the Systematic Modeling Method* *3.11 Cases of the Basic Form Extension Method*
Examination forms	*oral presentation, design project.*
Study and examination requirements	*Requirements for successfully passing the module*
Reading list	*1. LUO Lingling. Creative Thinking Training. Capital University of Economics and Business Press. 2008.* *2. Wu Xuefu. Think, Do, Design: A training course that quickly improves creative ability. Social Sciences Academic Press. 2007.* *3. CHEN Ping. Theme Design and Comprehensive Representation: Another Way of Observing. Higher Education Press. 2008.* *4. GUO Wei, LU Honglei,LI Jingjing. Product Design Idea Sketch & Design Expression/Full Picture Book. Hubei Fine Arts Publishing House. 2016.* *5. LIANG Wen. Making Design: A Case Study of Experimental Design Course at the Academy of Arts and Design, Tsinghua University. Tsinghua University Press. 2019.* *6. It should be released to the sky. Design Thinking and Expression. Huazhong University of Science and Technology Press. 2005. 7. Koos Elssen. Product hand-drawn and design thinking. China Long Years Press. 2016. 8.* *7.GUO Wei, LU Honglei,LI Jingjing. Product Design: Idea Sketch & Design Expression. Hubei Fine Arts Publishing House. 2016.* *8.Creative Thinking Methods. ZHU Zhongyan, DING Yi. Peking University Press. 2021*

Module designation	*Ergonomics*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Mengya Cai*
Language	*Chinese*
Relation to curriculum	*Elective* *"Ergonomics" is an interdisciplinary discipline that systematically studies the interaction between*

	man, machine and working environment, and is one of the basic compulsory courses of product design and industrial design.
Teaching methods	*lecture, lesson, lab works, project,seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 120* *Contact hours:48 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:72*
Credit points	*4 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Understand the importance of ergonomics in product design and master its fundamental theoretical framework and key design methodologies.* *Skills: Based on ergonomic knowledge, acquire the ability to identify and apply critical human-machine-environment parameters in design processes, thereby enhancing design humanization and feasibility, while developing competencies for conducting design analysis and optimization from an ergonomic perspective.* *Competences: Ergonomics involves substantial quantitative analysis. Through studying ergonomic principles and engaging in design practice, one can further develop logical thinking skills, strengthen analytical reasoning, and ultimately enhance design capabilities and professional competencies.*
Content	*Chapter 1: Overview of Ergonomics* *Concepts of ergonomics, historical development, classifications, key elements, and the relationship between ergonomics and design.* *Chapter 2: Human Sensory Systems*

	Definition and characteristics of human sensation,Definition and characteristics of human perception,Visual, auditory, and other sensory systems,Information processing models,Influence of physical environments and socio-cultural factors on sensory perception. *Chapter 3: Human Body Dimensions and Workspace Design* *This chapter introduces anthropometrics (the study of human body measurements) and its role in workspace design. Chapter 4: Design of Human-Machine Control Devices* *This chapter systematically examines control device design from ergonomic and biomechanical perspectives, structured into four core modules.* *Chapter 5: Interaction Design* *This chapter systematically examines human-machine interface (HMI) design and interaction paradigms.* *Chapter 6: Human-Machine System Design* *This chapter introduces human-machine systems (HMS) and their systematic design methodology, focusing on the "Human-Machine-Environment" framework.* *Chapter 7: Emerging Trends in Ergonomics & Human Factors Engineering* *This chapter explores cutting-edge developments in ergonomics and presents landmark Chinese industrial cases demonstrating human-centered design innovation.*
Examination forms	*design project*
Study and examination requirements	*60%Final exams, 30%regular assignments, 10%attendance.*
Reading list	*Gou Rui. Ergonomics in Design [M]. Beijing: China Machine Press, 2020.* *Ding Yulan. Ergonomics (5th ed.) [M]. Beijing: Beijing Institute of Technology Press, 2017.*

	Ruan Baoxiang, Shao Xianghua. Human Factors Engineering in Industrial Design (2nd ed.) [M]. Beijing: China Machine Press, 2010. *Zhou Meiyu. Applied Ergonomics in Industrial Design [M]. Beijing: China Light Industry Press, 2015.*

Module designation	*Format Design*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Mingjie Zhu*
Language	*Chinese*
Relation to curriculum	*Elective* *"Typography Design" is a basic course course for industrial design. Typography is an important part of modern design art and an important means of visual communication. It is not only a knowledge of arrangement, but also a skill, and a production activity with a high degree of unity between science and art. The scope of layout design can involve newspapers, magazines, books, albums, product samples, calendars, posters, record sleeves, corporate identity (CI) and web pages and other graphic design fields, its design principles and theories run through every graphic design. The art of typography design provides a broad world for people to create new ideas and cultural concepts, and has become an important interface for people to understand the times and recognize society. Through the course learning, students will cultivate independent spirit, innovative ideas and a sense of social responsibility, and be able to carry forward the practice of visual communication design, advocate labor, carry forward the traditional excellent culture, and cultivate talents with an international vision.*

Teaching methods	*lecture, lesson, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 60* *Contact hours:16 including lecture, exercise.* *Private study including examination preparation, specified in hours:44*
Credit points	*2 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Understand the fundamental principles, requirements, and guidelines of layout design, as well as analyze exemplary classic cases.* *Skills: Apply graphic design software to create a complete layout design project.* *Competences: Through the layout design course, cultivate innovative thinking, promote outstanding traditional culture, and gradually develop an internationalized modern design perspective.*
Content	*Chapter 1: Fundamentals of Layout Design* *This chapter introduces the core concepts of layout design.* *Chapter 2: Principles of Layout Design* *This chapter systematically examines the fundamental principles of layout design.* *Chapter 3: Principles of Layout Design* *This chapter explores the aesthetic foundations of layout design, analyzing the relationship between modern layout cases and the Three Major Compositions (plane, color, and spatial design). It covers the application of point, line, and plane in layout design, as well as the visual principles of two-dimensional (2D) and three-dimensional (3D) design in modern typography.*

	Chapter 4: Typographic Layout Design *This chapter focuses on text arrangement principles in layout design, mastering how typography enhances accuracy, legibility, readability, and aesthetics in visual communication.* *Chapter 5: Integration of Graphics and Typography in Layout Design* *This chapter examines the dynamic interplay between graphics and text in layout design, exploring how their spatial relationships evoke distinct emotional responses while fulfilling functional communication needs.*
Examination forms	*design project*
Study and examination requirements	*60%Final exams, 40%regular assignments*
Reading list	*Ouyang, W. (2023). Layout design: 6-week learning handbook. Posts & Telecom Press.* *Xu, N., & Wei, K. (Eds.). (2009, May). Layout design. Beijing: China Youth Press.* *Dabner, D. (2005, March). UK layout design coursebook. Shanghai: Shanghai People's Fine Arts Publishing House.* *Zhou, Y., & Hao, W. (Trans.). (2011, August). Layout design: Japanese graphic designers' reference manual. Beijing: Posts & Telecom Press.*

Module designation	*Open Source Hardware and Programming*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Jinglu Li*
Language	*Chinese*
Relation to curriculum	*Elective* *Combined with the positioning of the School of Art and Design of Shanghai University of Engineering Science,*

	aiming at the construction goal of AI artificial intelligence open source hardware and programming courses for third-year students majoring in industrial design, it aims to cultivate students' innovative design ability and practical skills to meet the needs of the intelligent era. This course focuses on the combination of open-source hardware and AI technology to strengthen students' programming thinking, intelligent system design, and interdisciplinary application skills. Through project-driven teaching, students can master the application of AI technology in industrial design in the process of solving practical problems, and promote them to become high-quality application-oriented industrial design talents with international vision, innovative spirit and practical ability. As a professional course of industrial design, through the study of this cou students can have the ability to master the basic theory and application of applied computers, master the relevant technologies of interactive product design, complete the ability to analyze and process information data, and have the ability to produce AI-based intelligent interactive product design.rse,
Teaching methods	*lecture, lesson, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90* *Contact hours:32 including lecture, exercise.Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Master the core principles of open-source hardware/software programming and understand AI application technologies for visual, auditory, and tactile systems in product design.* *Skills: Master Arduino open-source development boards with programming and AI algorithm integration.*

	Competences: Cultivate students' rigorous academic attitude, strong teamwork spirit, and innovative mindset while fostering socialist core values, and develop their capability to create intelligent technological solutions addressing challenges in smart living, transportation, healthcare, and urban development.
Content	*Chapter 1: Course Concepts and Standards* *Concepts, standards, and case studies of interactive installation art, covering tangible interfaces, core components, and classic works.* *Chapter 2: Interactive Installation Design & Training* *Hands-on training in interactive installation design through case studies (e.g., 'Abstract Painter'), covering BEAM robotics, digital prototyping with open-source tools, and theme-based development methodologies.* *Chapter 3: Open-Source Hardware & Advanced Applications* *Arduino platform setup, sensor-driver programming, and specialized electives (creative coding/AI/wearables) for interactive installations.* *Chapter 4: Comprehensive Practice in Exhibition Interactive Design* *Comprehensive assessment through interactive design project presentations, evaluating mastery and methodological application with real-time feedback to enhance learning outcomes.*
Examination forms	*oral presentation, design project*
Study and examination requirements	*60%Final exams, 30%regular assignments , 10%attendance.*
Reading list	*Tang Qian. Arduino Creative Project Programming: From Beginner to Advanced, China Electric Power Press, 2022.* *Banzi, M. (2011). Getting started with Arduino (X. Yu & H. Guo, Trans.). Posts & Telecom Press. (Original work published 2008)*

	Cooper, A., Reimann, R., & Cronin, D. (2012). About Face 3: The essentials of interaction design. Publishing House of Electronics Industry. *Moggridge, B. (2006). Designing interactions. MIT Press.*

Module designation	*Product Structure Design*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Zhongming Ren*
Language	*Chinese*
Relation to curriculum	*Elective* *"Analysis of Product Structure Design" is a professional elective course in the undergraduate curriculum system of product design. Through the study of this course, students can have the basic knowledge of structural design required for product design, have the ability of preliminary product structure analysis and design, and have professional skills such as design expression and innovation ability.*
Teaching methods	*lecture, lesson, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90* *Contact hours:32 including lecture, exercise.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Understand and master the basic knowledge and methods of product structure design, including the basic concepts and classification of product structure design, basic principles of structure design, common product structure design such as folding/fitting/connection,*

	movable structure design such as basic connecting rod, gear, crankshaft, static structure design of metal/plastic materials, etc. *Mster the relevant theoretical knowledge of product structure design, and have the ability to analyze the key structure of the product and the realization of technology.* *Skills: To be able to independently complete the structural design of common products, solve complex and practical product structure design problems, and cultivate the engineering landing ability and innovative thinking ability of design.* *Combined with practical problems, able to draw structural diagrams, make structural grass models, and achieve dynamic demonstrations of key structures.* *Competences: Cltivate the consciousness of independent innovation, establish cultural self-confidence, so that the designed products can better serve the needs of national social development and consumer needs.* *Through innovative thinking, the new design scheme can put forward the solution of structural design.*
Content	*Chapter 1 Overview of Product Structure Design* *basic concepts and principles of 1.1 product structure* *basic knowledge of 1.2 structure design* *development and Evolution of 1.3 Product Structure Design* *Chapter 2 Basic Principles of Product Structure Design* *principle of 2.1 Mechanics* *2.2 Simple mechanical principle* *motion Diagram of 2.3 Structure* *2.4 plane degrees of freedom* *2.5 Other Fundamentals*

	Chapter 3 Common Product Structure Design and Application *3.1 polyhedron structure and application* *3.2 Folding Structure and Application* *3.3 fit structure and application* *3.4 Connection Structure and Application* *3.5 Surface, Shell, membrane structure and application* *3.6 Topology and Application* *structure and Application of 3.7 Foundation Connecting Rod* *structure and Application of 3.8 Gear, Cam and Crankshaft* ***C**hapter 4 Material-based static product structure design.* *3.1 plastic material structure design* *3.2 metal material structure design* *3.3 composite structure design*
Examination forms	*essay, design project*
Study and examination requirements	*60%Final exams, 30%regular assignments , 10%attendance.*
Reading list	*Zhang Ying, Wang Yigang, Chen Yuxi. Product Structure Design [M]. Tsinghua University Publishing House, 2023.04. ISBN:978-7-302-62734-6.* *[1] Wei Jiaxing. Product Structure Design and Typical Cases [M]. Beijing: Chemical Industry Press, 2023.04. ISBN:978-7-122-42892-9. [2] Chen Yumiao. Product Structure Design Methods and Cases [M]. Hangzhou: Zhejiang University Press, 2023.11. ISBN:978-7-308-23593-8. [3] Liu Baoshun. Product Structure Design [M]. Beijing: China Construction Industry Press, 2009.11. ISBN:978-7-112-1310-1.*

Module designation	*Product and information interaction Design*

Semester(s) in which the module is taught	*6*
Person responsible for the module	*Ziran Zhang*
Language	*Chinese*
Relation to curriculum	*Elective* *Through the study of this course, students can master the basic theories and application of computer applications, master the related technologies of interactive product design, complete the ability to analyze and process information data, and have the ability to produce interactive product design.*
Teaching methods	*lecture, lesson, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90* *Contact hours:32 including lecture, exercise.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: cultivate students' rigorous academic attitude, have a good sense of teamwork and innovative spirit, establish correct socialist core values, and consciously inherit and promote Chinese excellent traditional culture.* *Master the basic principles and design methods of interaction design.* *Master the relevant theoretical knowledge of interactive product design, and have the ability to analyze the key technical indicators and technical implementation of the product.* *Skills: Ability to apply Arduino technology to product design practice operations.* *Practical operation and processing programming ability of Arduino open source development board.*

	Combined with practical problems, make interactive product model, and realize the programming work of key electronic circuit connection and Arduino open source hardware. *Competences: Ability to design and report the final work.* *Through innovative thinking and the application of various types of materials, for the new design can propose interactive product design solutions.*
Content	*chapter 1 Curriculum Concepts and Standards* *1. Overview of interactive installation art* *2. Interaction and interaction* *3. The Tangible User Interface* *4. Classic works of interaction design* *5. Basic composition of interactive device* *Chapter 2 Interactive Product Design and Training teaching content:* *section 1 Design of Simple Interactive Device* *section 2 Design of Digital Interactive Device* *Chapter 3 Interactive Installation Art Appreciation* *section 1 Appreciation of Interactive Device Design I-A Feast of Visual Interaction* *section 3 Appreciation of Interactive Device Design II-A Feast of Interaction with Hearing* *section 3 Appreciation of Interactive Device Design III-A Feast of Interaction with Tactile* *section 4 the fourth section of interactive device design appreciation four-a perfect Interactive Feast with people* *chapter 4 Creative Interactive Product Design Practice* *1. Course Content* *2. Practice Process* *1) Overview of thematic design teaching method* *2) Selection of theme*

	3) Theme Import *4) Theme Design requirements* *Chapter 5 Arduino working platform* *section 1 Arduino Hardware* *section 2 Arduino Getting Started* *chapter 6 Comprehensive Design Practice of Interactive Product Design Works* *The comprehensive test evaluates students' mastery of display interaction design and the application ability of design methods in the way of reporting, comments in time, and deepens the teaching effect.*
Examination forms	*design project*
Study and examination requirements	*60%Final exams, 30%regular assignments , 10%attendance.*
Reading list	*Jiang Lijun. AI Product Design and Interactive Prototype Development [M]. South China University of Technology Press, 2024.* *[1] Massimo Banzi [US], translated by Yu Xinlong and Guo Haoyun. Fall in love with arduino[M]. People's Posts and Telecommunications Publishing House, 2011 [2] [US] Alan Cooper,[US] Robert Reimann,[US] Dacid Cronin. About Face3 - - essence of interactive design [M]. Electronic Industry Press, 2012 [3] Moggridge, Bill. Designing Interactions. MIT Press (MA). 2006 [4] Three Times Publishing Co., Ltd. New media device [M]. Huazhong University of Science and Technology Press, 2018. [5] art force international Publishing Co., Ltd. Interactive installation art [M]. Huazhong University of Science and Technology Press, 2019.*

Module designation	*Design Psychology*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Zhuang Yi*

Language	*Chinese*
Relation to curriculum	*Elective* *Design psychology is the basic theory course of art and design major, and it is the basic theory that art and design students must master. This course is based on psychology and is a study of people's psychological states, especially people's psychology of products and space needs, and how they act on design through consciousness. Through the study of this course, students will understand the basic theoretical system of design psychology, and initially learn to creatively propose and solve design problems from the research of design psychology. Understand the relationship between design and consumer psychology, the criteria of "good design", and be able to deeply study the influence of product color, structure, function and other aspects on design psychology on the basis of course learning.*
Teaching methods	*lecture, lesson, lab works, project, seminar.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90* *Contact hours:32 including lecture, exercise.* *Private study including examination preparation, specified in hours:58*
Credit points	*3 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Guided by the socialist core values, strengthen the study of the impression factors of national culture in design psychology, and cultivate students to establish national cultural confidence and understand the diversity of national culture.* *Master the basic theoretical knowledge of design psychology and the psychological and behavioral laws of users.*

	Learn the basic theoretical knowledge of design in industrial design; And be able to apply basic theoretical knowledge to design practice. Have the ability to use basic theoretical knowledge flexibly. *Have humanities and social science literacy, social responsibility, can coordinate the development of knowledge, ability and quality.* *Skills: Able to complete a design through computer-aided design software, with the ability to reasonably select design software; Able to complete a series of design drawings and be able to fully explain the drawings.* *Competences: through learning, students have the ability to analyze user needs and research methods.* *master the theoretical principles of design psychology and be able to apply them to design and practice.* *Through case analysis, students 'market-oriented thinking in design practice is cultivated to improve their systematic design ability.* *Apply the basic theoretical knowledge of design psychology to investigate and analyze the needs of users.* *Can carry forward patriotic feelings, improve self-cultivation, and the spirit of struggle.*
Content	*chapter 1 Overview of Design Psychology* *the concept of psychology; The historical dev elopment of psychology; Psychology towards design; The concept and application of design psychology.* *Chapter 2 Sensation and Perception* *The basic knowledge of feeling, the formation of different senses and impressions; The defi nition of perception; The characteristics of per ception; The expression of perception in desig n works.*

	Chapter 3 Cognition and Learning *Cognitive psychology: information processing t heory; Definition of cognition; Definition and c haracteristics of attention; Memory: Learning Strategies; Usability design.* *Chapter 4 Designing Feelings and Emotional Design* *The definition of emotion and emotion; The e xpression of emotion and the particularity and hierarchy of emotion; The design strategy of emotional skin and emotion and the expressio n of design emotion.* *Chapter 5 Psychological Research Methods* *Problems of psychological research; Methods of psychological research; Points for Attention of different methods of psychological researc h; Analysis of psychological research; Applicat ion and expression of results.* *Chapter 6 Design Thinking Based on Needs* *The concept and basic characteristics of need s; Maslow's hierarchy of needs; The classifica tion of design thinking; The Psychology of ind ividual designers and the pressures faced by designers.*
Examination forms	*essay*
Study and examination requirements	*70%Final exams, 30%regular assignments and attendance.*
Reading list	*Design Psychology, Dalinon, Electronics Industry Press, 2022-03.* *1. Liu Ling. "Daily product design psychology" [M]. Beijing: Mechanical Industry Press, 2022. 2. [US] Donald. A. Norman. "Design Psychology" [M]. Beijing: CITIC Publishing House, 2018. 3. Liu Feng, Zhang Xiaobo. Design psychology [M]. Beijing: Tsinghua University Press, 2022.*

Module designation	*Industrial Engineering Software Pro/E*
Semester(s) in which the module is taught	*7*
Person responsible for the module	*Bing Teng*
Language	*Chinese*
Relation to curriculum	*Elective* *Pro/Engineer operation software is a 3D integrated CAD/CAM/CAE software under Parametric Technologies (PTC) in the United States. Pro/Engineer software is known for its parametric technology, which is the earliest application of parametric technology, and occupies an important position in the field of 3D modeling software. Industrial Engineering Software PRO/E is a basic software course, which mainly explains the application of the software, which is suitable for mechanical design and other majors with similar teaching requirements to industrial design. To develop students' computer graphics skills in 2D/3D mechanical parts drawings, assembly drawings and surface modeling.*
Teaching methods	*lecture, lesson, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*Contact hours:16 including lecture, exercise, and test.* *Private study including examination preparation, specified in hours:44*
Credit points	*2 ECTS CP*
Required and recommended prerequisites for joining the module	*N/A*
Module objectives/intended learning outcomes	*Knowledge: Software knowledge: Master the operation and use of design and development related software such as Auto CAD, two-dimensional plane, three-dimensional modeling, open source programming, etc., and can be applied to design practice.*

	Innovative thinking: Possess design innovative thinking and ability, able to integrate social, health, safety, legal, cultural and environmental factors, and embody innovative consciousness in the design and development process. *Skills: Train students to have strong ability to read and draw specifications for mechanical parts drawings and assembly drawings.* *Competences: Cultivate students' spatial thinking ability and product modeling innovation ability.* *Students have a strong ability to analyze problems, self-study ability and team cooperation ability, cultivate patriotism.* *Practice ability: be able to flexibly apply the professional knowledge learned to professional practice, and be able to take into account the perspectives of society, health, safety, law, management and cultural environment in practice, carry out practical and realistic industrial design comprehensive practice activities, solve real industrial design problems, and put forward valuable design solutions.* *Professional norms: be able to clarify and abide by relevant professional ethics and norms in the design, development, production and other business practices of industrial products, and fulfill job responsibilities.*
Content	*the teaching of this course mainly includes three parts: Part drawing, assembly drawing and surface modeling drawing. The specific contents and requirements are as follows:* *develop the basic ability to draw parts drawings, Assembly drawings and surface modeling (such as mobile phones, mice, etc.) for machines of medium complexity.* *Part drawing:* *Understand the function and content of the parts drawing, and master the method of drawing the three-dimensional parts drawing according to the three views of the parts.* *Assembly drawing*

	Understand the function and content of the assembly drawing, and be able to make the three-dimensional assembly drawing according to the assembly drawing and the drawn part drawing. *Surface modeling* *Mster surface modeling basic commands, can draw out their own design of a variety of surface shapes.*
Examination forms	*design project*
Study and examination requirements	*40%Final exams, 50%regular assignments , 10%Class Performance*
Reading list	*Lin Qingan. Fully proficient in Pro/ENGINEER Wildfire 4.0 Chinese version of the basic intro duction to part design. Beijing: Electronics Ind ustry Press, 2009.* *Lin Qingan. Pro/ENGINEER Wildfire 3.0 Chine se version of dynamic mechanism design and simulation. Beijing: Electronic Industry Press, 2007. Lin Qingan. Pro/ENGINEER modeling s urface design. Beijing: Electronic Industry Pre ss, 2006. ZHAO Chun, WANG Yingling. Pro/E Wildfire 5.0 practical tutorial. Illustrated versio n. Electronic Industry Press, 2015. Wang Zhiji an, Guo Xuee. Pro/ENGINEER Wildfire 5.0. B asic course Hunan University Press, 2015.*