Appendix B

Module Handbook of Energy and Power Engineering Program

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Module designation	
Module level, if applicable	
Code, if applicable	6000017
Subtitle, if applicable	
Courses, if applicable	Ideological and Moral Cultivation and Legal Basis
Semester(s) in which the moduleis taught	Spring and autumn semester of first year
Person responsible forthemodule	Professor GONG Junwei
Lecturer	Associate Professor JIAO Fengmei Associate Professor DING Jianfeng LecturerI Xiaobing Lecturer ZHANG Haihui
Language	Chinese
Relation to curriculum	"Ideological and Moral Cultivation and Legal Basis" is guided by Marxism-Leninism, Mao Zedong Thought, Deng Xiaoping Theory, the important thought of the "Three Represents", the Scientific Outlook on Development, and Xi Jinping Thought onSocialism with Chinese Characteristics for ANew Era, and takes the core values of socialism as the main line. Based on the law of undergraduates' growth and development and using relevant subjects' knowledge, this course is a compulsory course of ideological and political theory that educates and guides undergraduates to strengthen their cultivation of worldview, outlook on life, values, morality and law consciousness. It is not only with ideological, political and theoretical characteristics, but also has strong practical characteristics. It is a comprehensive basic discipline, which lays the foundation for students to further study other related courses in college.
Type of teaching, contact hours	Classroom teaching, social practice teaching Contact hours: 32 hours
Workload	Workload = 90class hours Contact hours = 32 class hours Practical teaching = 16 class hours Self-study hours =42 hours
Credit points	3
Requirements according to the examination	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.

regulations	
Recommended prerequisites	N/A
Module objectives/intended learning outcomes	Through this course, teachers can accurately and completely teach the basic position, main theoretical views and scientific methods of Marxism to students. ● Knowledge: Reflects Xi Jinping's thoughts on socialism with Chinese characteristics in the new era and the spirit of the 19th National Congress of the Communist Party of China, fully reflects the new practice of socialist construction with Chinese characteristics since the 18th National Congress, and adapts to the characteristics of the development of the new era and the quality needs of universities ● Skills: It is necessary to focus on cultivating students' self-development ability to use theory to analyze and solve problems, so as to realize their various qualities of self-improvement ● Competences: Reflect the cultivation of practical ability, deepen students' ability to recognize and judge their own development and social problems, exercise and cultivate their practical ability in self-development and problem-solving
Content	Introduction （2 Contact hours, 2 Practical teaching hours, 6 Self-study hours） ● We are in the new era of socialism with Chinese characteristics ● The new generation should take national rejuvenation as its own duty Chapter 1 Questions of youth in life （4 Contact hours, 2 Practical teaching hours, 6 Self-study hours） ● Outlook on life is the general view of life Chapter 2Firming ideals and beliefs （4 Contact hours, 2 Practical teachinghours, 6 Self-study hours） ● The connotation and importance of ideals and beliefs ● Lofty ideals and beliefs ● Letting youth dream fly in the practice of realizing Chinese dream Chapter 3 Carrying forward the Chinese spirit （4 Contact hours, 2 Practical teachinghours, 6 Self-study hours） ● The Chinese spirit is the soul of rejuvenating and strengthening the country ● patriotism and the requirements of the times ● Letting reform and innovation become the driving force of

	youth voyage Chapter 4 Practicingsocialist core values （4 Contact hours, 2 Practical teachinghours, 6 Self-study hours） ● The common value pursuit of all the people ● Firming the self-confidence of values ● To be an active practitioner of socialist core values Chapter 5 Understanding, and strictly observe the private and public morality （6 Contact hours, 2 Practical teachinghours, 6 Self-study hours） ● Morality and its change and development ● Absorbing and drawing on excellent moral achievements ● Observing the moral standards of citizens ● Toward the upper and the good, the unity of knowledge and action Chapter 6 Respecting, learning and observing the law（8 Contact hours, 4Practical teachinghours, 6 Self-study hours） ● The characteristics and operation of socialist law ● The socialist legal system with Chinese characteristics taking the constitution as the core ● Building a socialist legal system with Chinese characteristics ● Adhering to the way of socialist rule of law with Chinese characteristics ● cultivating the thought of rule of law ● The exercise of rights and performance of obligations in accordance with the law
Study and examination requirements and forms ofexamination	The total scores are determined by the usual scores (50%, including attendance 10 scores, presentation 10 scores, reading report 10 scores, practice report 20 scores, total 50 score) and the final examination scores (50%).
Media employed	N/A
Reading list	Textbook: Ideological and moral cultivation and legal basis, compiled by the textbook compilation research group, published by higher education press, 2018 revised edition. References: [1] Xi Jinping. Talk about governing the country. Beijing: Foreign Language Press, 2017. [2] The excerpt on Xi Jinping's discourseof the comprehensive framework for promoting the rule of law. Beijing: Central Literature Publishing House, 2015. [3] Constitution of the people's Republic of China. Beijing: China Legal Publishing House, 2018 [4] Theory Bureau of the Propaganda Department of the CPC Central Committee. Face to face legal hot spots.

Beijing: learning press, people's publishing house, 2015.
[5] Theory department of people's daily. The power of spirit: the latest interpretation of the great spirit of the Communist Party of China. Beijing: People's daily press, 2016.
[6] Organized by the Propaganda Department of the Party committee of Peking University. Cast Soul: Twelve lectures on socialist core values. Beijing: Peking University Press, 2017.
[7] Li Lin. the road to the development of the rule of law in socialism with Chinese characteristics. Beijing: China Legal Publishing House, 2018.

Module designation	
Module level, if applicable	
Code, if applicable	6000185
Subtitle, if applicable	
Courses, if applicable	Outline of Chinese Modern History
Semester(s) in which the moduleis taught	Fall and spring semester of first year
Person responsible forthemodule	Professor CHEN Baoyun
Lecturer	Associate professor JIAO Lianzhi Associate professor WU Tiannan Associate professor MA Yun Associate professor SU Bo Lecturer ZHAO Jingtao
Language	Chinese
Relation to curriculum	This course, together with "Ideological and moral cultivation and legal basis", "Introduction to basic principles of Marxism" and "Introduction to Mao Zedong Thought and theoretical system of socialism with Chinese characteristics", constitutes the content system of Marxist political theory courses. The common task of these courses is to educate young students about the basic principles and theories of Marxism, tohelp them establish a correct outlook on world and life, and to strengthen their faith in socialism and communism. The course "outline of Chinese modern history" provides rich historical materials for the other courses. Closely combined with the reality of the development of Chinese modern history, by offering analysis of relevant historical processes, events and figures, it improves the ability of students to analyze and evaluate historical problems, more specifically, to distinguish between right and wrong in history and the social development direction by using scientific historical view and methodology.
Type of teaching, contact hours	Classroom teaching, Self-study Contact hours: 48 hours
Workload	Workload = 90class hours Contact hours = 48 class hours Self-study hours =42 hours
Credit points	3
Requirements	Students with class attendance rate over 2/3 and assignment

according to the examination regulations	completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Ideological and moral cultivation and legal basis
Module objectives/intended learning outcomes	The purpose of this course is to enable students to understand the historical process and its intrinsic regularityof modern Chinese social development and revolutionary development, and achieve the goal of enabling them to “understand the national history and national conditions, deeply comprehend the history and how the people chose Marxism, the Communist Party of China, and the socialist road"; to further establish the faith that “only socialism can save China, only socialism can develop China” and to strengthen their confidence in taking the road of socialism with Chinese characteristics. At the same time, closely combined with the historical reality of modern China, by offering analysis of relevant historical processes, events and figures, it also enables students to improve their ability to analyze historical problems and distinguish historical right from wrong by using scientific historical view and methodology. ● Knowledge: understand the modern Chinese history and conditions, be familiar with the historical process of modern Chinese social development and its inherent regularity, and have a good grasp of the basic clues of modern Chinese history ● Skills: Through "reading history practice", classroom speeches, etc., train students to have the basic skills of learning and researching history, improve the use of scientific historical concepts and methodology to analyze and evaluate historical issues, distinguish historical right and wrong and the direction of social development ● Competences: Cultivate the spirit of science and innovation, improve comprehensive literacy
Content	Chapter 1 The struggle against foreign aggression (4 Contact hours, 4 Self-study hours) • Capital - imperialist aggression • The struggle against foreign armed aggression for national independence • The failure of the struggle against aggression and the awakening of national consciousness Chapter 2Early exploration of national outlet (4 Contact hours, 3 Self-study hours) • The rise and fall of the storm of farmer mass struggle

	• The rise and fall of the Westernization Movement • The rise and death of the Reform Movement Chapter 3 the Revolution of 1911 and the end of absolute monarchy (4 Contact hours, 3 Self-study hours) • Raising the banner of modern national democratic revolution • The revolution of 1911 and the establishment of the Republic of China • The failure of the 1911 Revolution Chapter 4 The epoch-making event (4 Contact hours, 4 Self-study hours) • The New Culture Movement and May 4th Movement • The further spread of Marxism and the birth of the Communist Party of China • Section 3The new situation of the Chinese revolution Chapter 5 The new path of the Chinese revolution (3 Contact hours, 3 Self-study hours) • The hard exploration of the new revolutionary road • The Chinese revolution advances in twists and turns of exploration Chapter 6 the Anti-Japanese War of the Chinese nation (6 Contact hours, 4 Self-study hours) • Japan launches an aggressive war to destroy China • The Chinese people rise up to fight against the Japanese invaders • The Kuomintang and the front battlefield of Anti-Japanese War • The Communist Party of China becomes the mainstay of the Anti-Japanese War • The victory of the Anti-Japanese War and its significance Chapter 7 The struggle for the new China (5 Contact hours, 4 Self-study hours) • From striving for peace and democracy to carrying out self-defense war • The Kuomintang government is surrounded by the whole people • The cooperation between the Communist Party of China and the democratic parties • Creating a new China of people's democratic dictatorship Chapter 8 The establishment of the basic system of socialism in China (4 Contact hours, 4 Self-study hours) • The beginning of the transition from New Democracy to socialism

	• The socialist road: history and the choice of the people • The road of transition to socialism with Chinese characteristics Chapter 9 tortuous development of socialist construction in exploration (4 Contact hours, 4 Self-study hours) • A good start • The serious twists and turns in exploration • The achievements of construction and exploration Chapter 10 The creation and continuous development of socialism with Chinese characteristics (6 Contact hours, 6 Self-study hours) • The great historical turn and the beginning of reform and opening up • The opening up and reform and the development of new situation of modernization • The continuous promotion of the enterprise of socialism with Chinese characteristics • Promoting socialism with Chinese characteristics at a new historical starting point Chapter 11 Socialism with Chinese characteristics entering a new era (4 Contact hours, 4 Self-study hours) • Opening up broad prospects for the development of socialism with Chinese characteristics • The historical achievements and historical changes in the enterprise of the party and the state • Striving for the great victory of socialism with Chinese characteristics in the new era
Study and examination requirements and forms ofexamination	Examination: the questions of final examination synthetically includemultiplechoice questions, judgment questions, material questions, discussion questions, etc., covering the whole textbook. The general evaluation results shall not exceed 30% based on the usual results (including attendance, discussion, etc.), 20% based on the "history reading and practice", and 50% based on the final examination papers.
Media employed	N/A
Reading list	Textbook: outline of modern Chinese history, the compilation team of this book, higher education press, 2018 edition. References: [1] Selected works of Marx and Engels, volume 1-4. Beijing: People's publishing house, 1995; [2] Selected works of Lenin, volume 1-3. Beijing: People's publishing house, 1995; [3] Metabolism of modern Chinese society, Chen xulu,

	Shanghai People's publishing, or volume I of Chen xulu's anthology; [4] Modern history of China, edited by Li Kan, Beijing: Zhonghua Book Company, 2005; [5] Cambridge History of China's late Qing Dynasty (Volume I and II), Fei Zhengqing, China Social Sciences Press, 1985; [6] Cambridgehistory of the Republic of China 1912-1949 (Volume I and II), China Social Sciences Press, 1998; [7] China's modernization and Westernization Movement, edited by Kong Lingren and Li Dezheng, Shandong University Press, 1992; [8] China's modernization, Gilbert Rothman, Jiangsu People's publishing house, 1995; [9] The History of May 4th Movement (Revised Edition), compiled by Peng Ming, people's publishing house, 1998; [10] Marxism in China: from the introduction of influence to communication, edited by Lin Daizhao, Tsinghua University Press, 1983; [11] Seventy years of the Communist Party of China, edited by Hu Sheng, party history press of the Communist Party of China, 1991; [12] Modern history of China, edited by Wang Huilin, Beijing Normal University Press, 1991; [13] The War history of the Chinese people's Liberation Army, edited by the Military History Research Department of the Academy of Military Sciences, PLA press, 1987; [14] 18. The course of China's modernization (Volume I, II and III), edited by Yu Heping, Jiangsu People's publishing house, 2001; [15] A hundred years of stumbling: the modern awakening of small-scale farmers in China, Jiang Yihua, Sanlian bookstore, 1992; [16] America in the eyes of an oriental diplomat, written by Wu Tingfang, translated by Li Xin, Xuelin press, 2006.

Module designation	
Module level, if applicable	
Code, if applicable	6000184
Subtitle, if applicable	
Courses, if applicable	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics
Semester(s) in which the moduleis taught	3th semester，4th semester
Person responsible forthemodule	Professor JIAO Lianzhi
Lecturer	Professor JIAO Yamin Associate Professor CHEN Baoyun Associate Professor GAO Bo Associate Professor WU Tiannan Associate Professor MA Yun Lecturer SU Bo Lecturer ZHAO Jingtao
Language	Chinese
Relation to curriculum	This course is a public compulsory course of social science for all majors of Undergraduates in our University. Through the study of this course, undergraduates can understand the basic theory of human social sciences guided by Marxism and its Sinicized theoretical achievements by forming the standpoints, viewpoints and methods of Marxism to analyze and solve problems, as well as by generating basic standpoints, attitudes and values towards problems of humane social science guided by Marxism. Teachers should aim to improve the theoretical level, the basic worldview and methodology of analyzing and solving problems of students, so as to lay the foundation for students to further study other related courses in University.
Type of teaching, contact hours	Classroom teaching, social practice teaching Contact hours: 48 hours
Workload	Workload = 150 class hours Teaching time = 80 class hours Practical teaching = 70 class hours
Credit points	5
Requirements according to the examination	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.

regulations	
Recommended prerequisites	Outline of Chinese Modern History
Module objectives/intended learning outcomes	Through this course, teachers should accurately and completely teach students the basic position, main theoretical views and scientific methods of Mao Zedong Thought and the theoretical system of socialism with Chinese characteristics. helping students understand and master the basic theory, basic line and the party's principles and policies of socialism with Chinese characteristics, it targets at assisting students to establish the common ideal of building socialism with Chinese characteristics, by enhancing their sense of social responsibility and historical mission, so that they can actively participate in the great practice of socialism with Chinese characteristics. ● Knowledge: understand the process of Sinicization of Marxism, understand the theoretical quality of Marxism advancing with the times, and establish firm confidence in building socialism with Chinese characteristics ● Skills: Master the theoretical results of the two historic leaps in the sinicization of Marxism, improve students' understanding and mastery of relevant theoretical knowledge, enhance the theoretical identification, institutional identification, and road identification of socialism with Chinese characteristics, and enhance the theoretical confidence of college students. System Confidence, Road Confidence, and Cultural Confidence ● Competences: Cultivate the ability to analyze and solve problems using Marxist positions, viewpoints, and methods, and strengthen the consciousness and firmness in implementing the party's basic line and basic program
Content	Chapter 1 Mao Zedong Thought and its historic position (4 contact hours; 4 self-study hours) • Formation of Mao Zedong Thought • The main content and living soul of Mao Zedong Thought • The historic position of Mao Zedong Thought Chapter 2 The theory of new democratic revolution (6 contact hours; 6 self-study hours) • The basis for the formation of the theory of the new democratic revolution • The general line and basic program of the new democratic revolution • The road and basic experience of the new democratic

	revolution Chapter 3 The theory of socialist transformation (6 contact hours; 6 self-study hours) • The transition from new democracy to socialism • The road and historical experienceof socialist transformation and • Establishment of the socialist system in China Chapter 4 The theoretical achievements in the preliminary exploration of the road of socialist construction (4 contact hours; 4 self-study hours) • The important theoretical achievements of preliminary exploration • The significance and experience of preliminary exploration Chapter 5 Deng Xiaoping Theory (6 contact hours; 6 self-study hours) • The formation of Deng Xiaoping Theory • The basic problems and main contents of Deng Xiaoping Theory • The historical position of Deng Xiaoping Theory Chapter 6 The important thought of "Three Represents" (6 contact hours; 5 self-study hours) • The formation of the important thought of "Three Represents" • The basic contents of the important thought of "Three Represents" • The historicstatus of the important thought of "Three Represents" Chapter 7 The scientific outlook on Development(6 contact hours; 5 self-study hours) • The formation of scientific development concept • The basic contents of the scientific outlook on Development • The historic position of the scientific outlook on Development Chapter 8 Xi Jinping‘s Thought on socialism with Chinese characteristics for a new era and its historical status (6 contact hours; 5 self-study hours) • Socialism with Chinese characteristics enters a new era • The main contents of Xi Jinping’s Thought on Socialism with Chinese Characteristics for a New Era • The historic status of Xi Jinping’s Thought on Socialism with Chinese Characteristics for a New Era Chapter 9The general task of upholding and developing

	socialism with Chinese characteristics (6 contact hours; 5 self-study hours) • Realizing the Chinese dream of the great rejuvenation of the Chinese nation • Strategic arrangements for building a great modern socialist country Chapter 10 Economic, political, cultural, social, and ecological progress (6 contact hours; 5 self-study hours) • Building a modern economic system • Developing socialist democracy • Promoting the prosperity of socialist culture • Insisting on ensuring and improving people's livelihood in development • Building a beautiful China Chapter 11 The Four-pronged Comprehensive Strategy(6 contact hours; 5 self-study hours) • Building a prosperous society in an all-round way • Deepening reformin an all-round way • Rule of law in an all-round way • Strictly governing the Partyin an all-round way Chapter 12 Promoting the modernization of national defense and the armed forces in an all-round way (6 contact hours; 5 self-study hours) • Adhering to the road of building a strong military with Chinese characteristics • Promoting the in-depth development of military-civilian integration Chapter 13 The great power diplomacywith Chinese Characteristics(4 contact hours; 4 self-study hours) • Adhering to the path of peaceful development • Promoting the construction of the community with a shared future for mankind Chapter 14 Upholding and strengthening the leadership of the party(6 contact hours; 6 self-study hours) • The key to the great rejuvenation of the Chinese nation lies in the Party • Upholding the Party's leadership in all work
Study and examination requirements and forms ofexamination	The total scores are determined according to the usual score (50%, including attendance 20 scores, outline 5 scores, practice report 15 scores, reading report 10 scores, total 50 scores) and the final exam score (50%).
Media employed	N/A
Reading list	Compilation team of this book. Introduction to Mao Zedong

	Thought and theoretical system of socialism with Chinese characteristics, Beijing: Higher Education Press, 2018 References: [1] Selected works of Mao Zedong (volume 1-4). Beijing: People's publishing house, 1991 [2] Selected works of Mao Zedong (Volume 5). Beijing: People's publishing house, 1977 [3] Mao Zedong Anthology (volume 1-8). Beijing: People's publishing house, 1993-1999 [4] Selected works of Liu Shaoqi (Volume I and Volume II). Beijing: People's publishing house, 1981, 1985 edition. [5] Selected works of Zhou Enlai (Volume I and Volume II). Beijing: People's publishing house, 1980, 1984 [6] Mao Zedong manuscript since the founding of the people's Republic of China(volume 1-13). Beijing: Central Literature Press [7] Selected works of Deng Xiaoping (volume 1-3). Beijing: People's publishing house, 1993, 1994 [8] Resolution of the CPC Central Committee on some historical issues of the party since the founding of the people's Republic of China. Beijing: People's publishing house, 1981 [9] Zhang Jingru, ed. Mao Zedong research book (five volumes). Beijing: Changchun publishing house, 1998 [10] Jin Chongji, ed. biography of Mao Zedong (1893-1949). Beijing: Central Literature Press, 1996

Module designation	
Module level, if applicable	
Code, if applicable	6000016
Subtitle, if applicable	
Courses, if applicable	Introduction to the Fundamental Principles of Marxism
Semester(s) in which the moduleis taught	The first and second semester of sophomore year
Person responsible forthemodule	Professor Shu Jianghua
Lecturer	Associate Professor Qi Weihong Associate Professor Yang Hewen Associate Professor Li Xiangshang Associate Professor Zhang Guihong Lecturer Wu Yifang Lecturer Yu Ludan Lecturer Wu Yidi Lecturer Zhao Zheng.
Language	Chinese
Relation to curriculum	The "Introduction to the basicPrinciples of Marxism" is known as the major course in the ideological and political course system in colleges and universities. This course forms the basis of the ideological and political theory course system, thus the other courses in the same system may present as the expansions, applications and concretizations of the Marxist theory of worldview, outlook on life, values and the rules of social development, as well as methodology,whichisin different fields and levels. Students are required to masterthe basic theories of Marxism and know how to apply them to understanding and analyzing social phenomenon and problems in practice, including forming a correct understanding of the nature of human society, the driving force of social development and basic laws of social development. More specifically, being acquainted with the new situations and problems arising from the development of capitalism and socialism and the inevitability of socialism replacing capitalism, students are expected to strengthen their faith in socialism and communism.
Type of teaching, contact hours	Classroom teaching, Self-study Contact hours: 48 hours
Workload	Workload = 90 class hours

	Contact hours = 48 class hours Self-study hours =42 hours
Credit points	3 credit points
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	“Ideologicaland Moral Cultivationand Legal Basis” and “Outlineof Chinese Modern History” are pre-required
Module objectives/intended learning outcomes	The objective of this course is to deliver systematic education in Marxist theory to college students in various ways, such as providing them with guidance in mastering Marxist worldview and methodology, in acquiring the Marxist outlook on life and values, both of which would help them with observing and analyzing social problems, as well as in solving themwith reference to Marxist theories perspectives. Thus, this course also aims at laying a solid theoretical foundation for students to establish the idealsand beliefsof building socialism with Chinese characteristics and to consciously，maintain the adherence to the basic theory, line and program of communist party. ● Knowledge: master and understand the basic theories of Marxism ● Skills: Learn to use the basic principles of Marxism in practice to understand and analyze various practical social problems, and to correctly understand the nature of human society, the driving force of social development and the basic laws of social development ● Competences: Correctly understand the various new situations and new problems that have emerged during the development of capitalism and socialism, recognize the historical inevitability of replacing capitalism by socialism, and strengthen the belief in socialism and communism
Content	Introduction Chapter 1 The Materiality of The World and Its Law of Development (6 contact hours; 6 self-study hours) • The Diversity and the Material Unity of the World • The Universal interconnection and Development of Things • Materialist Dialectics Is the Fundamental Method for Us to Understand and Chang the World Chapter 2 Practice, Cognition and the laws of Development

	(7 contact hours; 6 self-study hours) • Practice and Cognition • Truth and Value • Understanding and Changing the World Chapter 3 Human Society and Its Development law (7 contact hours; 6 self-study hours) • The Basic Contradiction and the Law of Movement of Society • Momentum in the Development of Social History • The Historical，Role of People Chapter 4 The Nature and the law of Capitalism (7 contact hours; 6 self-study hours) • Commodity Economy and the law of Value • The Nature of Capitalist Economic System • The Capitalist Political System and The Ideology Chapter 5 The Development of Capitalism and Its Trends (7 contact hours; 6 self-study hours) • The Formation and Development of Monopoly Capitalism • How to Correctly Comprehend the Variation and Development on Contemporary Capitalism • The Historical Position of Capitalism and Its Development Trends Chapter 6 The Development and The Law of Socialism (7 contact hours; 6 self-study hours) • On The 500-year Historical Course of Socialism • General Principles of Scientific Socialism • Exploring the Developing Law of Realistic Socialism in Practice Chapter 7 The Lofty Ideal of Communism and Its Ultimate Realization (7 contact hours; 6 self-study hours) • Looking Forward to the Future Communist Society • The Realization of Communism Is the Inevitable Trend of Historical Development • The Lofty Communist Ideal and the Common Idea of Socialism with China's Characteristics
Study and examination requirements and forms ofexamination	A combination of process assessment and final assessment is adopted. The overall assessment includes usual performance and final exam, each of them accounts for 50%. The usual performance includes attendance and participation, in-class assignments and classroom performance.
Media employed	N/A
Reading list	Textbook: The compilation team of this book: I*ntroduction to the*

	Fundamental Principles of Marxism[M]. Higher Education Press, 2018. Reference: [1] K. Marx and Engels. *The Selections from Marx and Engels (Vol. 1-4)[M]*. The People's Publishing House, Beijing, 1995. [2] Vladimir Lenin. *karl Marx[M]*. The People's Publishing House, Beijing, 1995. [3] Vladimir Lenin. *V.I.LENIN Selected Works (Vol. 2)[M]*. The People's Publishing House, Beijing, 1995. [4] Mao Tse-tung. *Selected Works of Mao Tse-tung (Vol.1)[M]*. The People's Publishing House, Beijing, 1991. [5] Mao Tse-tung. *Collected Works of Mao Tse-tung (Vol.8)[M]*. The People's Publishing House, Beijing, 1999. [6] Deng Xiaoping. *Selected Works of Deng Xiaoping (vol. 2)[M]*. The People's Publishing House, Beijing, 1993. [7] Jiang Zemin. *On "three representatives"[M]*. Central Party Literature Press, Beijing, 2001. [8] Hu Jintao. *Firmly March on the Path of Socialism with Chinese Characteristics and Strive to Complete the Building of a Moderately Prosperous Society in All Respects[M]*. The People's Publishing House, Beijing, 2012. [9] Xi Jinping. *Speech at the Symposium on Philosophy and Social Science[M*]. The People's Publishing House, Beijing, 2016. [10] Xi Jinping. *Secure a Decisive Victory in Building a Moderately Prosperous Society in All Respects and Strive for the Great Success of Socialism with Chinese Characteristics for a New Era[M]*. The People's Publishing House, Beijing, 2017. [11] Xi Jinping. *Xi Jinping: The Governance of China[M]*. Foreign Language Press, Beijing, 2018.

Module designation	
Module level, if applicable	
Code, if applicable	600002
Subtitle, if applicable	
Courses, if applicable	Situation and Policy
Semester(s) in which the moduleis taught	spring and fall semesters of freshman, sophomore and junior year
Person responsible forthemodule	Associate Professor Gao Bo
Lecturer	Lecturer Zhang Zongfeng Lecturer Zhao Jingtao
Language	Chinese
Relation to curriculum	This course is a public foundation course (compulsory), being regarded as a significant part of the national ideological and political education system for university students.
Type of teaching, contact hours	Classroom teaching Contact time: 32 class hours
Workload	Workload = 60 class hours Contact time = 26 class hours Examination and correction time= 6 class hours Self-study = 28
Credit points	2 credit points
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	N/A
Module objectives/intended learning outcomes	"Situation and Policy" is among the main courses that constituting the college ideological and political theory course system, as the education of situations and policies is regarded as a significant part of the national ideological and political education for university students. The purpose of these series of courses is turning the classes into the main channels andfrontfor teachers to carry out the education on the situations and policies, which plays an important role in the quality education of university students. ● Knowledge: On the basis of introducing the current domestic and foreign economic and political situations, international relations and hot events at home and

	abroad, clarified the basic principles, basic positions and response policies of the Chinese government ● Skills: focus on the combination of theory and practice, history and reality, stability and variability, learning knowledge and development ability ● Competence: On the basis of understanding the current domestic and foreign economic and political situations, international relations, and domestic and foreign hotspot events, be able to clarify the basic principles, basic positions and response policies of the Chinese government
Content	Lecture One: *Analysis of the Current International Situation* (8 contact hours, 2 Examination and correction time, 9 self-study hours) Lecture Two: *Analysis of the Current Economic Situation* (9 contact hours, 2 Examination and correction time, 9 self-study hours) Lecture Three: *Analysis of Current Domestic Situation* (9 contact hours, 2 Examination and correction time, 10 self-study hours)
Study and examination requirements and forms ofexamination	The total score consists of two parts: the regular performance accounts for 30% and the final exam accounts for 70%. The usual performance includes attendance & participation (20%) and classroom performance (10%). The final exam takes the form of a paper.
Media employed	N/A
Reading list	[1] The Publicity Department of the CPC Central Committee. *Theoretical Hot Spots, Face to Face[N].* People's Education Press, Beijing. [2] *Current Affairs Report (undergraduate edition) [J].* Current Affairs Report, Beijing. [3] Literature Research Office of the CPC Central Committee. *Selection of Important Documents Since 19th CPC National Congress Published (volume 1) [C].* Central Party Literature Press, Beijing, 2014. [4] *"Qiushi Journal ", "China Comment ", "Outlook"*, *"Reference News"*and other topical periodicals magazines, newspapers, etc. [5] Websites: http://www.people.com.cn/; http://www.xinhuanet.com/; http://www.gmw.cn/, etc.

Module designation	
Module level, if applicable	
Code, if applicable	2900096
Subtitle, if applicable	
Courses, if applicable	College English A (1) (2) (3)
Semester(s) in which the moduleis taught	1st semester, 2nd semester, 3rd semester
Person responsible forthemodule	Lecturer Xie Hua
Lecturer	Lecturer Hu Rufang Lecturer Zhang Fangfang Lecturer Xue Yan Lecture Chen Huilian Lecturer Zhou Yuzhen
Language	English
Relation to curriculum	The course is a general academic English course and is offered in 3 semesters. The course content includes academic listening, academic reading, and basic English academic skills. The course requires students to master academic English skills. Through classroom and extracurricular self-study, students can effectively train and improve their written and oral academic English communication skills. It is hoped that through the three-semester course study, students will have a certain ability to use English for their professional work after graduation, or for further study or academic research. From the time freshmen entering the school, the purpose of the course is to allow students to read academic articles to learn information, learn formal academic vocabulary, write essays supported by literature, carry out speculation training, etc. In the future, professional study and research in English will be an important foreshadowing.
Type of teaching, contact hours	Targeted students:1st year and 2nd year undergraduates Type of teaching: Classroom teaching Contact hours: 192 hours Of which Theoretical teaching: 162 hours Other activities: 30 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 360 hours Contact hours = 192 hours Self-study hours = 168 hours
Credit points	12.0

Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Junior high school English
Module objectives/intended learning outcomes	Module objectives: Students should acquire general oral and written communication skills in academic English as wellas communication skills in listening, such as listening to lectures, taking notes, reporting presentations, and participating in academic discussions. ● Knowledge: Pronunciation and spelling rules of English words, grammar rules, discourse rules, English speech and writing styles, intercultural communication principles. ● Skills: Basic listening, speaking, reading, writing and translation skills. ● Competences: Being able to express one's opinions both orally and in the written form.
Content	Theoretical teaching (192 contact hours; 168 self-study hours) **1st semester** 1. Unit 1 Food Science (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary 2. Unit 2 Technology (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary 3. Unit 3 Identity (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary 4. Unit 4 Health (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary 5. Unit 5 Psychology (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary 6. Unit 6 Zoology (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary 7. Unit 7 Sports (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary 8. Unit 8 Urban Planning (8 contact hours; 7 self-study

	hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary 9. Others (practices, mid-term exams, etc.) **2nd semester** 1. Unit 1 Multidisciplinary Education (12 contact hours; 10 self-study hours) • Listening: Unit 1 Access to success; Intercultural Reading Unit 1 2.Unit 2 The Scientific Method (12 contact hours; 10 self-study hours) • Listening: Unit 2 Emotions speak louder than words; Intercultural Reading Unit 2 3.Unit 3 Ancient China's Contribution to Science (12 contact hours; 10 self-study hours) • Listening: Unit 3 Love your neighbor; Intercultural Reading Unit 3 4.Unit 4 Responsibility of Scientists (12 contact hours; 10 self-study hours) • Listening: Unit 4 What's the big idea; Intercultural Reading Unit 4 5.Unit 6 Fraud and Academic Dishonesty (12 contact hours; 10 self-study hours) • Listening: Unit 6 Histories make men wise; Intercultural Reading Unit 6 6. Others (practices, mid-term exams, etc.) (4 contact hours; 6 self-study hours) **3rd semester** 1. Unit 1 Food Science (8contact hours; 8 self-study hours) • Listening: Unit 1 How we behave is who we are; Intercultural Reading Unit 1 2. Unit 2 Technology (8contact hours; 8 self-study hours) • Listening: Unit 2 Getting older, getting wiser; Intercultural Reading Unit2 3. Unit 3 Identity (8contact hours; 8 self-study hours) • Listening: Unit 3 Discovering your niche holiday; Intercultural Reading Unit 3 4. Unit 4 Health (8contact hours; 8 self-study hours) • Listening: Unit 4 Solving problems & seeking happiness; Intercultural Reading Unit 4 5. Unit 5 Psychology • Listening: Unit 5 Art expands horizons; Intercultural Reading Unit4 (8contact hours; 8 self-study hours) 6. Unit 6 Zoology (8contact hours; 8 self-study hours) • Listening: Unit 6 Mass media: 24/7 coverage; Intercultural Reading Unit 4 7. Unit 7 Sports (8contact hours; 8 self-study hours) • Listening: Unit 7 Trouble in modern times; Intercultural Reading Unit4

	8. Others (practices, mid-term exams, etc.) (8contact hours;)
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (closed book written examination) (70%). Usual performance includes: assignment , attendance and class performance
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Jinlong Han, Ling Cui. New Era Academic English Integrated Course 1. Shanghai: Shanghai Foreign Language Education Press, 2018. [2] ZhengShutang. New Horizon University English Audiovisual Course (Third Edition) 2. Beijing: Foreign Language Teaching and Research Press, 2015. [3] Li Jianbo. Cross-cultural communication English reading course. Shanghai: East China Normal University Press, 2017. 2. reference book: [1] Department of Higher Education, Ministry of Education. Teaching Requirements for College English Courses [M]. Beijing: Higher Education Press, 2007. [2] CaiJigang. New core comprehensive academic English course 1, 2, 3 teacher's book [M]. Shanghai: Shanghai Jiaotong University Press, 2014. [3] A new edition of College English Second Edition (Twelfth Five-Year): College English Grammar Manual (Revised Edition). Shanghai: Shanghai Foreign Language Education Press, 2013. [4] New English Test Band Four for Xinchao University. Shanghai: Fudan University Press, 2014. [5] 5. Various dictionaries

Module designation	
Module level, if applicable	
Code, if applicable	2900100
Subtitle, if applicable	
Courses, if applicable	College English B (1) (2) (3)
Semester(s) in which the moduleis taught	1st semester, 2nd semester, 3rd semester
Person responsible forthemodule	Lecturer Xie Hua
Lecturer	Lecturer Hu Rufang Lecturer Zhang Fangfang Lecturer Xue Yan Lecture Chen Huilian Lecturer Zhou Yuzhen
Language	English
Relation to curriculum	This course is taught to Non-English majors in the first and year of undergraduate, is a compulsory public basic course. The course of college English language knowledge and application skills, learning strategy and cross-cultural communication and business knowledge, such as general teaching goal is to cultivate the students' English comprehensive application ability, to make them in the future work and social activities can effectively in English both written and spoken communication, at the same time to improve their ability of autonomous learning, improve the comprehensive cultural literacy.
Type of teaching, contact hours	Targeted students:1st year and 2nd year undergraduates Type of teaching: Classroom teaching Contact hours: 192 hours Of which Theoretical teaching: 162 hours Other activities: 30 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 360 hours Contact hours = 192 hours Self-study hours = 168 hours
Credit points	12.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3are allowed to take the exam.

Recommended prerequisites	Junior high school English
Module objectives/intended learning outcomes	Module objectives: The teaching should continue to cultivate students' comprehensive English application ability, especially listening and speaking ability, and at the same time enhance their independent learning ability and improve their comprehensive cultural quality. ● Knowledge: students are required to master the grammar rules not only in reading comprehension as they did in high school but also in accurate translation and composition writing; largely expand their recognizable vocabulary and enhance their awareness of correct usage and frequent collocations of core vocabulary; acquire necessary knowledge about the culture of English-speaking countries, especially that of America and the UK, communication-related etiquette and signs and cues of socializing in culturally different everyday life; learn some basics of paragraph translation and how it differs from sentence translation in translating strategies and skills; use English as a tool to have some knowledge about various fields in the reading materials. ● Skills: be able to read articles of various genres and on various topics including humanities and popular science and common technology; be able to understand listening aterials of all kinds of topics of everyday life and academic issues on the mediate level; be able to do paragraph translation on general topics and academic issues of the common kinds; be able to express themselves orally in quite fluent and accurate English. ● Competences: by taking the course of English Band 2, students are expected to acquire certain skills in listening comprehension, speaking, reading and translating, so as to lay the foundation for the study of follow-up advanced English. Besides, students are supposed to promote their intercultural communication awareness and competence. By virtue of having abundant group work and individual tasks, students are also expected to be more autonomous and ready for the follow – up courses which requires more self-teaching and self-discipline. Accurate written English and fluent spoken English is one of the necessary conditions required for enterprise talents.
Content	Theoretical teaching (192 contact hours; 168 self-study

	hours) **1st semester** 1 Living Green (10 contact hours; 8 self-study hours) • listening 2, intercultural reading unit 1 2 Tales of True Love (10 contact hours; 8 self-study hours) • listening 2 chapters, intercultural reading unit 2 3 Friendship (10 contact hours; 8 self-study hours) • listening 2 chapters, intercultural reading unit 3 4 Study Abroad (10 contact hours; 8 self-study hours) • listening chapter 2, intercultural reading unit 4 5 Pioneers of Flight (10 contact hours; 8 self-study hours) • listening 2, intercultural reading unit 5 6 Maker Movement in China (10 contact hours; 8 self-study hours) • listening 2, intercultural reading unit 6 7. Others (exercises, mid-term exams, etc.) (4 contact hours; 8 self-study hours) **2nd semester** 1 Working Holiday Abroad (10 contact hours; 8 self-study hours) • listening 2, intercultural reading unit 1 2Conspicuous Consumption (10 contact hours; 8 self-study hours) • listening, chapter 2, intercultural reading unit 2 3 Cultural Differences (10 contact hours; 8 self-study hours) • listening, chapter 2, intercultural reading, unit 3 4. Emerging Adulthood (10 contact hours; 8 self-study hours) • listening chapter 2, intercultural reading, unit 4 5 Digital Age (10 contact hours; 8 self-study hours) • listening 2, intercultural reading unit 5 6. Unit 6 Determination (10 contact hours; 8 self-study hours) • listening 2, intercultural reading 7. Others (exercises, mid-term exams, etc.) (4 contact hours; 8 self-study hours) **3rd semester** 1. Ocean Exploration (10 contact hours; 8 self-study hours) • listening 2, intercultural reading unit 1 2. China in Transition (10 contact hours; 8 self-study hours) • listening 2, intercultural reading 2 3.Job Hunting (10 contact hours; 8 self-study hours) • listening, chapter 2, intercultural reading unit 3 4. Women Nobel Prize Winners (10 contact hours; 8 self-study hours)

	• listening 2, intercultural reading unit 4 5.Cyber Language (10 contact hours; 8 self-study hours) • listening 2, intercultural reading unit 5 6.Human-robot Relations (10 contact hours; 8 self-study hours) • listening 2, intercultural reading unit 6 7. Others (exercises, mid-term exams, etc.) (4 contact hours; 8 self-study hours)
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (closed book written examination) (70%). Usual performance includes: assignment , attendance and class performance
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Teaching materials: [1] Li yinhua, jipeiying, fengyu, et al. New Progressive College English: Integrated Course Book 2. Shanghai: Shanghai foreign language education press, 2017. [2] 2. Zhengshutang, Ed. English audio-visual course of new horizon university (third edition) 2. Beijing: Beijing foreign studies press, 2015. Reference: [1] Department of higher education, ministry of education. Teaching requirements for college English courses [M]. Beijing: higher education press, 2007. [2] College English second edition (12th five-year plan) : college English grammar manual (revised edition). Shanghai: Shanghai foreign language education press, 2013.

Module designation	
Module level, if applicable	
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	College English C (1) (2) (3)
Semester(s) in which the module is taught	1st semester, 2nd semester, 3rd semester
Person responsible for the module	Lecturer Xie Hua
Lecturer	Lecturer Hu Rufang Lecturer Zhang Fangfang Lecturer Xue Yan Lecture Chen Huilian Lecturer Zhou Yuzhen
Language	English
Relation to curriculum	This course is based on basic English teaching. Students have accumulated an English vocabulary of about 2000-3000 in junior high school and senior high school, and have a certain reading ability in Chinese. As a basic course integrated with listening, speaking, reading, writing and translating, this course requires the students to have a certain basis in these aspects, that is, to meet the requirements of the full-time senior high school syllabus. This course is related to various subjects, such as physics, chemistry and politics.
Type of teaching, contact hours	Targeted students:1st year and 2nd year undergraduates Type of teaching: Classroom teaching Contact hours: 192 hours Of which Theoretical teaching: 162 hours Other activities: 30 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 360 hours Contact hours = 192 hours Self-study hours = 168 hours
Credit points	12.0
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Junior high school English
Module	The overall goal of college English teaching is to cultivate

objectives/intended learning outcomes	students' comprehensive application ability in English, enable their effective oral and written communication with English in their future work and social contact, enhance their independent learning ability and improve their comprehensive cultural accomplishment at the same time. The method of classified guidance is adopted to promote their personalized development. ● Knowledge: students are required to master the reading and listening materials the course has provided and obtain the corresponding vocabulary. ● Skills: be able to understand materials exposed, such as letters, emails, news, magazines, and videos, etc. be able to describe a fact or a phenomenon, give presentations, and express ideas, proposals, and suggestions. ● Competences: by learning this course, students are expected to acquire certain skills in listening, speaking, reading writing and translation, so as to lay the foundation for the further study of follow-up courses and use the language as a communicative tool. Just acquiring the vocabulary is not enough, though it is very important in English learning. In the study of this level, students should not be staying at the vocabulary level, they should be thinking in an English way and understand English materials more profoundly and critically. They should be expressing themselves with more confidence and more fluently besides catching the listening materials and understanding the reading materials. 1. Vocabulary: to master 4500-5000 words and expressions; 2. Listening: to understand the lecture in the class or on general topics and daily conversations; 3. Speaking: to talk fluently in English with foreigners by using certain conversation strategies, discuss on a topic and give a presentation after preparation; 4. Reading: to understand English articles of medium difficulty, grasp the main idea and details, identify the attitude and comment with effective reading techniques; 5. Writing: to employ writing skills to write a 120-150-word article on a general topic within 30 minutes and describe the experiences, facts, attitudes and feelings well, with no big grammatical mistakes and ambiguity. 6. Translation: to translate Chinese into English or vice versa with translation skills and remain faithful to the original.
Content	Theoretical teaching (192 contact hours; 168 self-study

	hours) **1st semester** Unit 1 Growing Up (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 2 Friendship (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 3 Understanding Science (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 4 The American Dream (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 5 Work or Live to Live Work (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 6 Romance (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 7 Animal Intelligence (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 8 Animal Intelligence (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Others (practices, mid-term exams, etc.) **2nd semester** Unit 1 Ways of Learning (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 2 Values (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 3 Generations Gap (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 4 The Virtual World (8 contact hours; 7 self-study hours)

	• Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 5 Overcoming Obstacles (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 6 Women, Half the Sky (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 7 Learning About English (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 8 Protecting Our Environment (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Others (practices, mid-term exams, etc.) **3rd semester** Unit 1 Changes in the Way We Live (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 2 Givil-Rights Heroes (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 3 Security (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 4 Imagination and Creativity (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 5 Giving Thanks (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Unit 6 The Human Touch (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Making a Living (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing;

	Translating; Vocabulary Unit 8 Cloning (8 contact hours; 7 self-study hours) • Reading; Listening & Review; Speaking; Writing; Translating; Vocabulary Others (practices, mid-term exams, etc.)
Study and examination requirements and forms of examination	Testing is an effective means to check the implementation of the teaching syllabus and evaluate the teaching quality, which is also the main source of teaching feedback information and an important basis for improving teaching. The total score of a student is composed of the following parts: the usual score (attendance + homework + midterm) (30%) + the final exam score (70%). The final exam consists of objective questions 1and subjective questions. Collective marking is applied in test paper evaluation.
Media employed	multimedia computer, projector, laser pointer, blackboard, chalk
Reading list	Textbooks: [1] Yinhua Li, Peiying Ji, Yu Feng, et al. New Progressive College English Integrated Course 1. Shanghai: Shanghai Foreign Language Education Press, 2017. [2] Shutang Zheng. New Horizon College English (3rd edition). Beijing: Foreign Language Teaching and Research press [3] Jianbo Li. College English Reading Course in Cross-cultural Communication 1. Shanghai: East China Normal University Press, 2017. Reference books: [1] Department of Higher Education, Ministry of Education of the People's Republic of China. Teaching Requirements for College English Courses [M]. Beijing: Higher Education Press, 2007. [2] New College English (2rd edition) (the Twelfth Five-year Plan): College English Grammar Handbook (revised edition) [3] Mingdong Liu. New Trend College English Test Band 4 Course. Shanghai: Fudan University Press, 2019

Module designation	
Module level, if applicable	
Code, if applicable	2500088
Subtitle, if applicable	
Courses, if applicable	Fundamentals of programming B
Semester(s) in which the moduleis taught	1th semester
Person responsible forthemodule	Lecturer Li Fang
Lecturer	Lecturer Li Bo Lecturer Liu Daming Lecturer Liu Xiaoluo
Language	Chinese
Relation to curriculum	"Fundamentals of programming " is a basic technical course used to cultivate students' programming ability. It is a public basic course for non-computer engineering students. The purpose is to enable students to master the basic knowledge of computers; master the basic knowledge and grammar of the C language; master the basic methods of programming and gradually form correct programming ideas, be able to use the C language for programming and have the ability to debug programs. And then train students to master certain software development techniques and have certain software development capabilities. Lay a good programming foundation for students to learn professional knowledge and engage in engineering and technical work, so that students' comprehensive ability and overall quality are improved.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching Contact hours: 80 hours Of which Theoretical teaching: 48 hours Experiment / practice teaching: 32 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 150 hours Contact hours = 80 hours Self-study hours = 70 hours
Credit points	5.0
Requirements according to the examination	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.

regulations	
Recommended prerequisites	NULL
Module objectives/intended learning outcomes	After completing the course, students should achieve the following objectives: Knowledge objectives: 1. Understand the basic knowledge of computer, including basic knowledge of computer software and hardware, computer network, information security, etc., and master the representation and operation of computer numbers. 2. Understand the basic characteristics, preliminary knowledge and composition of C programs, master the basic knowledge and grammar of C program design, master the basic control structure and basic control sentences and related grammatical specifications of C language, master the basic knowledge and specifications of functions, and then master the structure The basic idea of standardized programming. Intended learning outcomes: ● Knowleges: Gradually master the methods of editing, debugging, and running programs, accumulate programming experience, master necessary programming skills, program testing and program debugging skills, gradually form correct program design thinking, and cultivate good programming style specifications and program debugging Ability. ● Skills:Master some commonly used algorithms, such as recursion, iteration, exhaustion, maximum and minimum, sorting, search, insertion, deletion, etc., and have the ability to use these algorithms to solve practical problems. ● Competences:Cultivate students' programming, development and testing skills, apply computational thinking to analyze and solve problems, as well as teamwork skills, and lay a solid foundation for subsequent courses and further acquisition of programming-related knowledge.
Content	I.Theoretical teaching (48 contact hours; 38 self-study hours) Chapter 0 Basic knowledge of computer (3 contact hours; 2 self-study hours) • The development of computer and information technology • Fundamentals of computer operation • How computers work • Fundamentals of computer hardware

	• Fundamentals of computer software • Fundamentals of computer network • Information security foundation Chapter 1 Introduction (3 contact hours; 2 self-study hours) • The concept of procedure • Initial knowledge of C program • Programming method Chapter 2 Input&Output（5 contact hours; 4 self-study hours） • Computer interaction and information display • Program input & output • Format input & output • Diversity of input & output Chapter 3 Sequential structure programming（5 contact hours; 4self-study hours） • Sequential structure • Expression statement • Data and data types • Variable storage • Pointer variable Chapter 4 Branch structure programming（5 contact hours; 4 self-study hours） • Representation of conditions • Simple branch programming • Multi branch structure programming • multi branch structure with switch statement Chapter 5Looping Structure Programming（6 contact hours; 4 self-study hours） • while Loop • do-while Loop • For loop • Nested Loop • Break and continue statements Chapter 6 Array（7 contact hours; 6self-study hours） • One dimensional array and its application • Two dimensional array and its application • Character array, string and its application • The preliminary concept of one dimensional array pointer Chapter 7 Function（7 contact hours; 6 self-study hours） • Basic knowledge of functions • Function call and return • Function parameters • Nesting and recursion of functions

	• Scope of variables and functions Chapter 8 Structure（4 contact hours;3 self-study hours） • Build the data types that users need • Application of structure pointer • Union • Enumeration type • Declare a new type name with typedef Chapter 9 Pointer（4 contact hours; 3 self-study hours） • Pointer and memory address • Basic knowledge of pointer • Special pointer II. Experiment / practice teaching (32 experiment hours; 32 self-study hours) （1）Input & Output (3 experiment hours; 3 self-study hours) （2）Sequential structure programming (3 experiment hours; 3 self-study hours) （3）Branch structure programming (4 experiment hours; 4 self-study hours) （4）Looping Structure Programming (6 experiment hours; 6 self-study hours) （5） Array (6 experiment hours;6 self-study hours) （6） Function (4 experiment hours; 4 self-study hours) （7） Structure (3 experiment hours; 3 self-study hours) （8）Pointer (3 experiment hours; 3 self-study hours)
Study and examination requirements and forms ofexamination	Final score includes: 1. usual performance (15%); Usual performance includes: assignment andattendance and computer practice 2. MOOC learning (15%), 3.Process computer test (70%)：Computer Basic test（15%）、Branch structure programming test（5%）、Loop structure programming test（5%）、ArrayTest（15%）、Final test（30%）
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1]. Zhangchao,Wangjianyun.<Fundamentals of computer application>-3rd Edition, Tsinghua university press, 2017 [2].Guchunhua,Chenzhangjin,Yewenjun.< Programming method and technology--C language>-1rd Edition, Higher Education Press, 2017 2. Reference books [1].Stephen Prata.<C Primer Plus>-6rd Edition, People's Posts and Telecommunications Press

Module designation	Mental Health for College Students
Module level, if applicable	
Code, if applicable	2700160
Subtitle, if applicable	
Courses, if applicable	Mental Health for College Students
Semester(s) in which the moduleis taught	1st semester
Person responsible forthemodule	Lecturer Guo ai
Lecturer	Associate professor Lin zhen Lecturer Cai yaqi
Language	Chinese
Relation to curriculum	This course is an important part of quality education in universities, which can provide mental health guidance for college students, popularize mental health knowledge, set up a good view of mental health, cultivate good psychological quality, and make the way of life development of college students more smooth.
Type of teaching, contact hours	Targeted students: freshman Type of teaching: classroom teaching contact hours:16 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 30 hours teaching hours = 16 hours Course Answer hours = 14 hours
Credit points	1.0
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Null
Module objectives/intended learning outcomes	Module objectives: students can understand the characteristics and rules of behavior and psychological development, take advantage of their strengths and avoid weaknesses, accept themselves, promote students' ability to strengthen and cope with overcoming difficulties and setbacks, constantly improve themselves and break through their potential, and improve their psychological quality. ● Knowledge: understand the characteristics and laws of

	behavior and psychological development ● Skills: help students identify common psychological problems and abnormalities of college students ● Competences: urge students to strengthen and cope with overcoming difficulties and setbacks, constantly improve themselves and break through potential, and improve their psychological quality
Content	Theoretical teaching (16 contact hours; 14 self-study hours) 1.Introduction to mental health of college students, psychological adaptation of freshmen (2 contact hours; 1 self-study hours) 2.Self-consciousness, personality (2 contact hours; 2 self-study hours) 3.Interpersonal communication and skills (2 contact hours; 2 self-study hours) 4.Sexual psychology and love psychology (2 contact hours; 2 self-study hours) 5.Emotional management and mental health (2 contact hours;2 self-study hours) 6.Stress management and frustration response (2 contact hours; 2 self-study hours) 7.Learning psychology, network mental health (2 contact hours; 2 self-study hours) 8.college students' common psychological problems and psychological counseling, life education and psychological crisis intervention (2 contact hours; 1 self-study hours)
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (open-book written examination) (70%). Usual performance includes: assignment and attendance.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] WANG li, CAOshuchun, LIjing. Theory and practice of mental health education for college students. Higher Education Press. 2. Reference books [1] HUANGxiongzhi, LIU min. mental health of new college students. China Light Industry Press. [2] SANGbiao. mental health of college students. Shanghai Education Press. [3] Microcourse edition of mental health education for college students, press: people's post andtele- communications press.

Module designation	Innovation, entrepreneurship and Employment guidance
Module level, if applicable	
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Innovation and Entrepreneurship Foundation
Semester(s) in which the moduleis taught	2th semester
Person responsible forthemodule	Associate professor RONG Qing
Lecturer	Associate professor ZHAO Qiaozi Lecturer WANG Xinyin Lecturer LI Chunli
Language	Chinese
Relation to curriculum	1. Understand the basic knowledge and processes required to carry out innovation and entrepreneurship activities, recognize the basic connotation of innovation and entrepreneurship and the particularity of entrepreneurial activities, and recognize and analyze entrepreneurs, entrepreneurial opportunities, entrepreneurial resources, entrepreneurial plans and entrepreneurial processes. 2. Understand innovative thinking methods, cultivate students' innovative and entrepreneurial spirit, enhance students' ability to collaborate in teams, and improve students' comprehensive quality and entrepreneurial employ ability. 3.Plant seeds of innovation and entrepreneurship for students, enable students to establish correct values, take the initiative to adapt to the needs of national economic and social development and people's comprehensive development, correctly understand the relationship between entrepreneurship and career development, consciously follow the law of entrepreneurship, and actively engage in entrepreneurial practice.
Type of teaching, contact hours	Targeted students: junior of Undergraduate innovation and entrepreneurship program Type of teaching: theoretical teaching, Practice for Innovative Ventures Contact hours: 32 hours Of which Theoretical teaching: 20 hours Experiment / practice teaching: 6 hours Case study: 6 hours

	Size of class: No more than 60 people for theoretical teaching
Workload	Workload=60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Innovation; Career Planning
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand combustion process and basic theories through teaching and practice. Specific objectives include: ● Knowledge: knowledge and rules of innovation and entrepreneurship. ● Skills: Students acquire basic theoretical and specialized knowledge about innovative ways of thinking, innovative entrepreneurship activities, improving the quality of innovation and entrepreneurship, integrating innovation and entrepreneurship into genes, and training innovative entrepreneurial talents. ● Competences: Students acquire practical abilities and innovative thinking on the basis ofEnergy big data and cloud computingtheories and engineering technology knowledge.
Content	Theoretical teaching (32 contact hours; 28 self-study hours) Chapter 1 Entrepreneurship and Life (4 contact hours; 4 self-study hours) Chapter 2 Creative Cogitation and Thinking Methods (4 contact hours; 4 self-study hours) Chapter 3 Entrepreneurs and Startup Teams (6 contact hours; 4 self-study hours) Chapter 4 Entrepreneurial Opportunities and Risks (5 contact hours; 4 self-study hours) Chapter 5 Entrepreneurship Resources and Venture Capital (5 contact hours; 4 self-study hours) Chapter 6 StartupPlaning (5 contact hours; 4 self-study hours) Chapter 7 Entrepreneurial Practice (3contact hours; 4 self-study hours)
Study and examination	Final score includes: usual performance (20%); experiment or Seminar (10%), final exam (report and proposal) (70%).

requirements and forms ofexamination	Usual performance includes: assignment and attendance and class discussions Experiment score includes: practice process; discussion Report (50%); Business Planning (50%)
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks, microphone
Reading list	1. Required books [1] Sun Hongyi. Innovation and Entrepreneurship Foundation. Beijing: Machinery Industry Press,2017. 2. Reference books [1] Dong Qingchun, Zeng Xiaomin. Entrepreneurship Action Manual. Beijing: Tsinghua University Press,2018. [2] Liu Zhiyang. Startup Canvas-12 Traps Entrepreneurs Need to Overcome. Beijing: Machinery Industry Press, 2018. 3. Experiment/seminar materials [1] Self-compiled teaching materials 4. Other materials [1]. PPT courseware (self-compiled)

Module designation	Innovative Entrepreneurship and Career Guidance Courses
Module level, if applicable	Skills of communication and cooperation
Code, if applicable	2700159
Subtitle, if applicable	
Courses, if applicable	Career Planning and Guidance
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Lecturer Wang Yunhuan
Lecturer	Lecturer Zhou Changchang Lecturer Wang Liping Lecturer Cheng Yong Lecturer Zhang Peili Lecturer Yang Hongna Lecturer Chen Peng
Language	Chinese
Relation to curriculum	Career Planning and Guidance is a required course of comprehensive quality for undergraduates.The course mainly provides students with career education, career ideal education and innovative entrepreneurship education.The main purpose is to guide students to establish a correct value,view of life and career ideals, make students learn to carry out scientific career planning,change in the professional environment and create conditions for smooth employment and entrepreneurship. This course is taught in a mixed online and offline mode. The part of online is mainly to explain the knowledge points on the courseware.Offline teaching is mainly based on experiential teaching, combined with classroom group discussions, career activities, online career assessments, and homework assignments, to enable students to understand, master,deepen the ideas and methods of career development and planning,and make students think about how to solve

	problems at various stages in career planning.At the same time, students are encouraged to write a career plan and contact the relevant departments of the school for face-to-face career counseling.
Type of teaching, contact hours	Type of teaching: theoretical teaching, Practice for Innovative Ventures Contact hours: 16 hours
Workload	Workload= 30 hours Contact hours = 16 hours Self-study hours =14 hours
Credit points	1.0
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	None
Module objectives/intended learning outcomes	Through the teaching of the course, students can be guided to understand university learning content and methods, clarify academic goals and tasks at various stages of the university, and improve academic planning capabilities. Students can understand the basic connotation and basic theory of career planning, and be familiar with the characteristics of the stages of career development.Students can understand theories related to self-cognition, promote correct self-positioning, master relevant career assessment methods, and learn to apply theories to career development.Students can understand the environmental factors that affect professional development, master the methods of cognition and analysis of professional environment, understand the content and methods of professional decision-making, improve professional decision-making ability, and set professional goals scientifically.Finally, students can clarify the channels for

	collecting employment information, improve their ability to collect job information and prepare job materials, master employment policies and procedures, be familiar with employment laws and regulations, and safeguard their legitimate rights and interests. ● Knowledge: master the basic theories, concepts, and main technical methods of college students' career development and planning ● Skills: Combining case explanations and a large number of in- and extra-curricular career activities to enable students to understand, master, and deepen the methods and skills of career development and planning ● Competences: to help students master the key points, cultivate the ability of self-study and independent analysis of problems, and initially have the ability to write career planning books
Content	Theoretical teaching (16 contact hours; 14 self-study hours) Chapter 1: College Life and College Career Planning (2 contact hours; 1 self-study hours) • Open a new chapter in college • Goals and tasks at all stages of college • College career planning • Common Problems and Solutions in College Life Chapter 2: Enlightenment of Career Planning (2 contact hours; 1 self-study hours) • Overview of Career Planning • Basic theory of Career Planning • Occupational Assessment Technology Chapter 3: Self-Cognition of Career Planning (4 contact hours; 4 self-study hours) • Overview of Self-Cognition • Cognition of Career Personality • Exploration of Career Interests • Assessment of Career Competence • Clarification of Career Values

	Chapter 4: Environmental Cognition of Career Planning (2 contact hours; 2 self-study hours) • Overview of Occupational Environment Cognition • Approach to Occupational Environment Cognition • First Look at the Workplace Chapter 5: Decisions and Actions of Career Planning (2 contact hours; 2 self-study hours) • Career Decision • Determination of Career Goals • Implementation and Evaluation of The Plan • Career Plan Chapter 6: Early Preparation for Job Application (2 contact hours;1 self-study hours) • Get Job Search Information and Find Employment Opportunities • Make the Perfect Job Search Material • Written Exam Skills • Interview Strategy Chapter 7: Protection of College Students' Employment Rights (2 contact hours;1 self-study hours) • Employment Agreement • Labor Contract • Employment Procedures • Common Employment Traps Chapter 8: Entrepreneurship (0 contact hours;2self-study hours) • Overview of Entrepreneurship • Entrepreneurship of College Students • Entrepreneurial Management
Study and examination requirements and forms of examination	Final score includes: usual performance (30%); final exam (open-book written examination) (70%). Usual performance includes: assignment and attendance.
Media employed	Multimedia Computers, Projector, Laser Pointers,

	Blackboard, Watercolor Pen,Chalks
Reading list	1. Required books [1]Shi Xiaohan, Zhang Yi. College Students' Career Development and Planning. Beijing: Tsinghua University Press, 2017. 2. Reference books [1]Shi Qiguang,Shi Xiaohan,Zhang Yi. College Students' Career Planning and Employment Guidance. Beijing: Modern Education Press, 2013. [2]Zhong Gulan,Yang Kai. College Students' Career Development and Planning.Shanghai: East China Normal University Press,2008. [3]Jin Shuren.Career Counseling and Guidance. Beijing: Higher Education Press,2007. [4]Diane Sukiennik.The Career Fitness:Exercising Your Options.Beijing:China Human Resources & Social Security Publishing Group Co.,Ltd,2017. [5]Robert C. Reardon.Career Development and Planning(Fourth Edition).Beijing:China Renmin University Press,2016.

Module designation	
Module level, if applicable	
Code, if applicable	600018301
Subtitle, if applicable	
Courses, if applicable	Energy and China
Semester(s) in which the module is taught	1st semester
Person responsible for the module	Professor LI Qifen Associate professor OUYANG Yuanhuang
Lecturer	Professor JIAO Yamin Professor TANG Zhong Professor ZENG Fengyu Associate professor ZHANG Guihong Associate professor ZHANG Zhousheng Lecturer YANG Yongwen Associate professor KONG Qingbao Professor QIU Zhongzhu
Language	Chinese
Relation to curriculum	This course is a public course for all undergraduates' majors of the university. Through this course, new undergraduates can understand the general background of the university's development, the history and trends of the development of the energy and power industry, and form the basic knowledge of our university and new ideas for their own majors to help students further study other related courses in the university.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 16 hours Of which Theoretical teaching: 16 hours Size of class: 100 students for theoretical teaching
Workload	Workload= 30 hours Contact hours = 16 hours Self-study hours = 14 hours
Credit points	1
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended	N/A

prerequisites	
Module objectives/intended learning outcomes	The teaching object of this course is the undergraduates of the whole university, which is a public elective course. By focusing on the core issues that are closely related to China's development in the energy field, the course is established in the background of the energy industry, which reflects the contemporaneity, cutting-edge and vividness; by digging into the humanistic and moral elements behind the development of energy and power, students are motivated to love their country, university and majors. ● Knowledge: master all aspects of energy development ● Skills: understand the thinking methods and main cases of analyzing energy problems ● Competences: able to analyze related energy issues in daily practice
Content	Theoretical teaching (16 contact hours; 14 self-study hours) 1. Energy Drives World—The World Rides on Energy (2 contact hours;1 self-study hours) • How natural energy changes human life • How fossil energy changes the world economy • How the development of new energy changes the world politics • How electricity becomes the most important end energy • How China realizes the dream of a energy-powerful country 2.Energy Distribution—China's Grand Strategy (2 contact hours;2 self-study hours) • Is China a big power country? • What are the characteristics of the distribution of China's energy resources in terms of time and space? • How to build a modern energy system with Chinese characteristics • How did China's energy resource mechanism and system reform develop with the electric power mechanism reform as the core? • How China will lay out technological development in the field of the science and technology of electric power • How China will lay out to achieve mutual benefit and win-win in the future development of world energy 3.Energy Security—the history of China’s Energy Security (2 contact hours; 2 self-study hours) • Is energy security important? • Is China's petroleum and gas safe? • Is China's electric power grid safe? • How can we guard China's energy security 4.Energy Innovation—How to Promote the Green

	Development (2 contact hours; 2 self-study hours) • What does the green development rely on • Energy Innovation: Status and Future • Where is the driving force for energy innovation in China? • Green development-do we have confidence 5.Energy and Environment—Is coal an original sin? (2 contact hours;2 self-study hours) • The relationship between energy development and environment • Fossil energy and its environmental pollution • Theory of sustainable energy development • The policy of China's Energy and Environmental Protection • Countermeasures of China's energy and environmental problems 6.Energy Cooperation—How China Energy Goes Abroad(2 contact hours;2 self-study hours) • What are the economic concepts in energy issues? • What is the background and goal of energy cooperation • What is the current pattern of energy in China and what are its challenges? • What are the ways of energy cooperation and the content of energy cooperation in key energy fields? • How to become the talent of international energy and electric power 7.Energy Utilization—How to promote China's energy consumption revolution (2 contact hours;2 self-study hours) • Why should China promote the energy consumption revolution? • How to comment on the past, present and future of China's energy consumption • What are the obstacles to China's energy consumption revolution? • What are the ways to promote China's energy consumption revolution? 8.The Dream of Energy Strengthens Nation—Why is China Electric Power No. 1 in the world (2 contact hours; 1 self-study hours) • How electricity is generated and transmitted to users • How does China's electricity become the top of the world • Can China’s electricity still achieve new breakthroughs? • How UHV becomes the core technology of Energy’s Strengthening Nation • Why China's UHV is an independent innovation • How to realize smart electricity grid and global energy internet

Study and examination requirements and forms of examination	Exam: Final exam questions include an understanding of energy-related historical and social issues, and a logical analysis of current energy-related issues in China's development. The overall evaluation score is based on the usual performance, accounting for 30% (including attendance, discussion, class performance, etc.); and the final assignment results are comprehensively determined, accounting for 70%.
Media employed	Multimedia computers, projector, blackboard, chalks
Reading list	[1] JIANG Zemin.Research on China's Energy Problems. Shanghai: Shanghai Jiaotong University Press, 2008. [2] LIU Zhenya.Global Energy Internet. Beijing: China Electric Power Press, 2015. [3] LIU Zhenya.China Electric Power and Energy. Beijing: China Electric Power Press, 2012. [4] 4.JIAO Yamin，ZHANG Guihong．A Course on the History of Energy Science and Technology. Shanghai: Fudan University Press, 2016.

Module designation	
Module level, if applicable	
Code, if applicable	2900129
Subtitle, if applicable	
Courses, if applicable	The Light of the Silk Road
Semester(s) in which the moduleis taught	1st semester
Person responsible forthemodule	Professor PanWeiming
Lecturer	Professor Zeng Fenyu Professor Zhu Qunzhi Professor Zhou Huijie Professor Zhao Dequan Associate processor Miao yin Associate processor FengWeilan Associate processor Shao Juan Associate processor Wang Zhiqin Associate processor Wen Zhongliang Associate processor Yu Zhangya
Language	Chinese
Relation to curriculum	The Light of the Silk Roadis one of the required courses (Ideological, Political Courses) for undergraduates of Energy and Power Engineering program. It is designed for three parts: the first part introducesStrategic Conception of the Silk Road，Five Links in the Belt and Road Initiatives;the second part explores The Historical Origin, The Trade Exchange, The Culture Exchange and Transmission and Inheritance of Art of the Silk Road; the third parts explains the Silk Road and Energy Sources, The Silk Road and the light of SUEP. It focuses on introduction of basic concepts ofOne Belt and One Road. It is not an entity and the mechanism, but the concept of cooperation and development.It relies on China and relevant countries' existing multilateral mechanism, by means of the existing effective regional cooperation platform to develop economic partnership with countries along B&R and build community of sharedinterests,common destiny and responsibility in politics and economics.It lays a foundation for understanding and analysis by students of The Belt and Road cooperation featuring mutual respect and trust, mutual benefit and win-win cooperation, and mutual learning between civilizations. As long as all countries along the Belt

	and Road make concerted efforts to pursue our common goal, there will be bright prospects for the Silk Road Economic Belt and the 21st-Century Maritime Silk Road, and the people of countries along the Belt and Road can all benefit from this Initiative.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 16 hours Of which Theoretical teaching: 16 hours Size of class: 100 students for theoretical teaching
Workload	Workload= 30 hours Contact hours = 16 hours Self-study hours =14 hours
Credit points	1.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, discussion participation rate over 2/3are allowed to write the final report.
Recommended prerequisites	No
Module objectives/intendedle arning outcomes	Module objectives: The task of this course is to enable students to understand That in the 21st century, a new era marked by the theme of peace, development, cooperation and mutual benefit, it is all the more important for us to carry on the Silk Road Spirit in face of the weak recovery of the global economy, and complex international and regional situations. Specific objectives include: ● Knowledge: Master basic knowledge onStrategic Conception of the Silk Road，Five Links in the Belt and Road Initiatives, The Historical Origin, The Trade Exchange, The Culture Exchange and Transmission and Inheritance of Art of the Silk Road, the Silk Road and Energy Sources, The Silk Road and the light of SUEP; understand the background, principles, framework, cooperation priorities, policy coordination, facilities connectivity, unimpeded trade,financial integration, cooperation mechanisms, China's Regions in Pursuing Opening-Up of the Silk Road. Through this course, students can acquire macro understanding and micro explanation of the silk road.

	● Skills: Students acquire basic theoretical and specialized knowledge about one belt and one road; understand China's vision of embracing a brighter future together, and China is really in action to attain the aim. acquire deep understanding that the development of the Belt and Road is open and inclusive, and we welcome the active participation of all countries and international and regional organizations in this Initiative, China will work with countries along the Belt and Road to carry out joint research, forums and fairs, personnel training, exchanges and visits under the framework of existing bilateral, multilateral, regional and subregional cooperation mechanisms, so that they will gain a better understanding and recognition of the contents, objectives and tasks of the Belt and Road Initiative. ● Competences: Students acquire innovative thinking on the basis of the light of the silk road.
Content	Theoretical teaching (16 contact hours，14 self-study hours) Chapter 1 Strategic Conception of the Silk Road (2 contact hours; 1 self-study hour); Chapter 2 Five Links in the Belt and Road Initiatives (2 contact hours; 2 self-study hour) Chapter 3 The Historical Origin of the Silk Road (2contact hours; 2 self-study hour) Chapter 4 The Trade Exchange of the Silk Road (2 contact hours; 2 self-study hour) Chapter 5 The Culture Exchange of the Silk Road (2 contact hours; 2 self-study hour) Chapter 6 Transmission and Inheritance of Art of the Silk Road (2 contact hours; 2 self-study hour) Chapter 7 The Silk Road and Energy Sources (2 contact hours; 2 self-study hour) Chapter 8 The Silk Road and the light of SUEP (2 contact hours; 1 self-study hour)
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (report on the subject) (70%). Usual performance includes: discussion and attendance.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books PPT courseware (self-compiled) 2. Reference books [1]. Liuzhengya Global Energy Interconnection. Beijing: China Electric Power Press, 2015

Module designation	
Module level, if applicable	
Code, if applicable	2900129
Subtitle, if applicable	
Courses, if applicable	Conspectus of Energy and Electric Power
Semester(s) in which the moduleis taught	1st semester
Person responsible forthemodule	Associate processor DING Jiafen
Lecturer	Professor Zeng Fenyu Professor Zhu Qunzhi Professor Zhou Huijie Professor Zhao Dequan Associate processor Miao yin Associate processor FengWeilan Associate processor Shao Juan Associate processor Wang Zhiqin Associate processor Wen Zhongliang Associate processor Yu Zhangya
Language	Chinese
Relation to curriculum	As a knowledge popularization course of energy, electricity and management, this course is open for freshmen, and does not involve pre course. The basic knowledge points of energy, electricity and management taught in this course can guide the follow-up professional courses for electric power majors; for non electric power majors, it is a good opportunity for them to contact energy, electricity and management and popularize electric power knowledge; at the same time, this course also organically connects the internal logical relationship between the main disciplines of the University and the main contents of the energy revolution Students will have a good foundation to understand and master China's energy policy.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 16 hours Of which Theoretical teaching: 16 hours Size of class: 100 students for theoretical teaching
Workload	Workload= 30 hours Contact hours = 16 hours

	Self-study hours =14 hours
Credit points	1.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, discussion participation rate over 2/3are allowed to write the final report.
Recommended prerequisites	None
Module objectives/intended learning outcomes	Module objectives: Students can understand and master the basic concepts of energy conversion, power production, power transmission and distribution, power application, and power economic management, as well as the main content of China's energy revolution and the development direction of energy policy. Specific objectives include: ● Knowledge: The basic knowledge and basic theory of energy conversion, power production, power transmission and distribution, power application, power economic management, energy revolution and energy policy are briefly introduced. During the teaching period, the course group arranges a weekly Q & A. ● Skills: A certain amount of thinking questions is arranged in each lecture to guide students to master the key points of relevant knowledge, and students are encouraged to choose a certain topic after class. ● Competences:Through the retrieval and summary of library bibliography and modern electronic literature, a large assignment is completed and submitted to the corresponding lecture teacher for correction.
Content	Theoretical teaching (16 contact hours，14 self-study hours) Chapter 1 Energy conversion and effective utilization (2 contact hours; 1 self-study hour) Chapter 2 Production process of thermal power plant (2 contact hours; 2 self-study hour) Chapter 3 Hydropower, nuclear power and new energy power generation (2contact hours; 2 self-study hour) Chapter 4 Electricity and its development (2 contact hours; 2 self-study hour) Chapter 5 Power system (grid), electrical equipment and safe use of electricity (2 contact hours; 2 self-study hour) Chapter 6 Application and development prospect of electricity and electric energy (2 contact hours; 2 self-study hour)

	Chapter 7 Power enterprise management (2 contact hours; 2 self-study hour) Chapter 8 Energy revolution and energy policy (2 contact hours; 1 self-study hour)
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (report on the subject) (70%). Usual performance includes: discussion and attendance.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	2. Required books PPT courseware (self-compiled) 2. Reference books [1] Gang Wei, Yongjian Zhang. Introduction to electric power engineering. Beijing: China Electric Power Press, 2009. [2] Zhong Tang. Modern electric power engineering and Technology Foundation. Beijing: China Electric Power Press, 2012. [3] Jiangchang Lu. Power enterprise management. Beijing: China Electric Power Press, 2007.

Module designation	Public Foundation Courses
Module level, if applicable	
Code, if applicable	2100033
Subtitle, if applicable	
Courses, if applicable	Mechanical Drawing A
Semester(s) in which the module is taught	1st semester
Person responsible for the module	Associate Professor ZHANG Meilin
Lecturer	Associate processor WU Binghui Lecturer MAN Jingyu Lecturer LIU Yinghui Lecturer WANG Fei
Language	Chinese
Relation to curriculum	Metalworking and metalworking practice provide the necessary preparatory knowledge for this course. This course lays an indispensable foundation for subsequent courses such as "Fundamentals of Mechanical Design" and course design, production practice and graduation design. At the same time, these courses also help students to improve their reading, drawing and illustration abilities.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching Contact hours: 120 hours Of which Theoretical teaching: 52 hours Experiment / practice teaching: 12 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Metal Technics，Metalworking Practice
Module objectives/intended	Module objectives: The main tasks of this course are: 1. study the basic theory

learning outcomes	and mapping method of orthographic projection; 2. develop the basic skills of drawing and reading engineering drawings; 3. develop spatial imagination and analytical skills through teaching and practice. Specific objectives include: ● Knowledge: Master basic theory of orthographic projection and the method of drawing required by studying the basic theory and mapping method of orthographic projection; Graphic geometry and graphic geometry of space can be represented in plane by using the basic theory of projection and the method of drawing; master the basic regulations of the national standards for engineering drawing, and correctly draw and read the drawings of the engineering drawing. ● Skills: Students acquire basic theoretical and specialized Knowledge about orthographic projection; the basic ability of drawing and reading mechanical drawings. Master the methods and steps of drawing sketches. Familiar with the national standard of mechanical drawing, and have the ability to select and draw standard parts. be able to read and draw simple part drawings and assembly drawing; Master the methods and steps of drawing sketches. Master the skills to use the measuring tools properly, aim to improve practical ability furthermore ● Competences: Students acquire practical abilities and innovative aim to improve practical ability furthermore engineering technology knowledge.
Content	1. Theoretical teaching (64 contact hours; 56 self-study hours) Chapter 1 Introduction (2 contact hours; 2 self-study hours) • Basic provisions for cartography;** • Usage of drawing tools;** • Geometric construction;* • Dimensional analysis and drawing of plane graphs;* • Drawing methods and steps;* Chapter 2 Overview of Projection Method and Projection of Points (2 contact hours; 2 self-study hours) • Overview of projection method;* • Two-sided projection of points;* • Three-sided projection of points;** • The relative position of two points;* Chapter 3 Projection of Straight Line (2 contact hours; 2 self-study hours)

	• Projections of straight lines and points on straight lines;* • Projection of straight line in special position;** • Finding the real length of line segment in general position;** • The relative position of two straight lines;** • Right angle projection;* Chapter 4 Projection of Plane (2 contact hours; 2 self-study hours) • Representation of plane;* • Projection of various position planes; ** • Lines and points in plane;* Chapter 7 Simple Solid and Intersection Line Between Plane and its Surface (2 contact hours; 2 self-study hours) • Points and lines on solid and its surface;** • Intersection line between plane and solid surface;** • dimensioning of solid;* Chapter 8 Intersection of Straight Line and Solid Surface, Intersection line of Two Solid Surfaces (4 contact hours; 4 self-study hours) • Intersection of line and solid surface;* • Intersection line of plane solid and curved solid surface;** • Intersection line of two curved solid surfaces;** • Intersection line of two plane solid surfaces;** Chapter 9 View and Dimensioning of Combination (6 contact hours; 6 self-study hours) • The analysis of combination form of combination;* • Drawing of combination;** • Dimensioning Composite Solids;** • Reading engineering drawings of the combination;** • Configuration design of combination • Introduction to the third angle projection;* Chapter 10 Common Expression Methods of Parts Shape (6 contact hours; 6 self-study hours) • view;* • cutaway view ;** • cross section;** • Partial enlargement and simplified drawing;** • Examples of application analysis of expression methods;** Chapter 11 The Axonometric Drawings (4 contact hours; 4 self-study hours) • Overview of axonometric drawing;* • Isometric diagram;*

	• Cavalier drawing;* • Sectioning in axonometric drawing;* • Intersection line on axonometric drawing;* • Sketch of the axonometric drawing;* Chapter 12 Overview of Part Drawing (2 contact hours; 2 self-study hours) • Relationship between Parts and Components;* • Common Process Structures of Parts;* Chapter 13 Drawing of Fasteners, Gears, Springs and Welded Parts (6 contact hours; 6 self-study hours) • Overview;* • Threaded and threaded fasteners;* • Gear;* • Key and pin connection;* • Spring;* • Antifriction bearing;* • Metal weldment;* Chapter 14 Part Drawing (6 contact hours; 6 self-study hours) • Contents of part drawing;* • Expression scheme and selection of parts;** • Dimensions of parts;** • Note writing of technical requirements on part drawings;* • Reading part drawing;** Chapter 15 Assembly Drawing (8 contact hours; 6 self-study hours) • Functions and contents of assembly drawings;* • Basic requirements of expression components and selection of expression methods;** • Dimension marking of assembly drawings and note writing of technical requirements;** • Drawing of component mapping and assembly drawings;** • Brief introduction of common assembly structures;* • Serial number and parts list of parts in assembly drawing;* • Reading the assembly drawing and draw the part drawing from the assembly drawing;** 2. Classroom practice (12 contact hours; 6 self-study hours) Drawing of plane figure; Drawing of combination; Expression practice of parts

	Parts mapping Disassemble and drawing the parts drawing according to the assembly drawing
Study and examination requirements and forms of examination	Final score includes: Learning outside the classroom：The study of online learning materials (10%); Homework (10%); Learning in the classroom: Attendance and Q&A(10%); Final exam: Closed book written examination (70%)
Media employed	Multimedia computers, Teaching wooden model, laser pointers, projector, blackboard, chalks
Reading list	1. Required books [1] Zhu Dongmei et al., Descriptive Geometry and Mechanical Drawing (6th Edition), Higher Education Press, June 2008 [2] Xu Tenggang, Editor-in-Chief, Descriptive Geometry and Mechanical Drawing Problem Set, Shanghai Jiaotong University Press, August 2006 2. Reference books [1] He Mingxin, Qian Keqiang, ed. Mechanical Drawing (5th Edition). Beijing: Higher Education Press, 2004.1. [2] Qiu wenyan, qu yuanshang. mechanical drawing and CAD basis. Shanghai: Shanghai jiaotong university press, 2001.8 [3] Zhu Hui et al., Descriptive Geometry and Engineering Drawing (5th Edition). Shanghai: Shanghai Science and Technology Press, 2003.9. 3.Other materials [1] PPT courseware (self-compiled)

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2800001-2
Subtitle, if applicable	
Courses, if applicable	Higher Mathematics A (1)(2)
Semester(s) in which the module is taught	1st, 2nd semester
Person responsible for the module	Associate Professor WU Beibei
Lecturer	Associate processor LI Lihua Associate processor WU Quanjun Associate processor XULi Associate processor ZHNAG Shenyaun Lecturer SONG Zhengfang Lecturer JIANG Shufa Lecturer LI Yan ect.
Language	Chinese
Relation to curriculum	Higher mathematics is one of the most important basic courses for undergraduates. Through the study of this course, students can master the basic knowledge of calculus, summarize the basic problems in energy and power engineering, and properly express them with mathematics, natural science, engineering foundation and professional knowledge. Be able to use the basic principles of mathematics, natural science and energy science to identify and judge the key links, steps and parameters in industrial processes, especially in complex energy and power engineering problems.
Type of teaching, contact hours	Targeted students: First year undergraduate Type of teaching: theoretical teaching Contact hours: 176 hours
Workload	Workload= 450 hours Contact hours =176 hours Self-study hours = 274 hours
Credit points	15.0
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	elementary mathematics

Module objectives/intended learning outcomes	Through the study of this course, students can understand the basic ideas of higher mathematics, grasp the basic methods of variable analysis, and master the basic formulas and rules of calculus operation. They can also increase the ability of using calculus to solve practical problems, during which their ability of logical thinking and basic arithmetic are enhanced; Besides, students' ability to find problems, analyze problems and solve problems will be promoted; it also lays a solid foundation for their subsequent professional courses. ● Knowledge: This course aims to introduce a fundamental knowledge of calculus. It mainly includes function and limit, derivatives and differentials, mean value theorem and its applications, indefinite integral, definite integral, application of definite integral, introduction to differential equations. ● Skills: Understand the theory and methods of derivative and integral for functions of several variables. Skillfully compute partial derivatives and multiple integrals. ● Competences: Providing students with an in-depth applied mathematics training in their capability of both analyzing and solving problems in the field. This course will also provide the foundation for students' studies in other following course to apply the theory to and skills to practice, e.g. problems in geometry and physics.
Content	Theoretical teaching (176 contact hours; 274 self-study hours) Chapter 1 Functions and Limits (22contact hours, 35 self-study hours) • Mappings and functions • The limit of the sequence of numbers • The limit of the function • Infinitesimal and infinity • Limit algorithm • Limit existence criteria two important limits • Comparison of infinitesimal • Continuity and discontinuity of functions • Operations of continuous function and continuity of elementary functions • Properties of continuous functions in the closed interval Chapter 2 Derivatives and Differentials (14contact hours, 22 self-study hours) • The concept of derivatives • The derivation rule of the function • Higher order derivatives • The derivatives of Implicit function and functions determined by the parametric equations Relevant rate of

	change • Differentials of functions Chapter 3 Applications of Differential Mean Value Theorem and Derivatives (18contact hours, 28 self-study hours) • Differential mean value theorem • The L'Hospital law • Taylor formula • Monotony of the function and Convexity of the curve • The extreme value and the maximum and minimum of function • Description of function graph • Curvature Chapter 4 Indefinite Integral(10contact hours, 15 self-study hours) • The concept and properties of indefinite integral • Integral integration method • Integration by parts • Integration of Rational Function • Use of integral table Chapter 5 Definite Integral (10contact hours, 15 self-study hours) • The concept and properties of definite integral • The basic formulas of calculus • Definite integration by Substitution and Parts • Abnormal integral Chapter 6 Applications of Definite Integrals (8contact hours, 12 self-study hours) • Elemental method of definite integral • Application of definite integral in geometry • Application of definite integral in physics Chapter 7 Differential Equations (14contact hours, 22 self-study hours) • Basic concepts of differential equations • Differential equation of separable variable • Homogeneous equation • First-order linear differential equations • Total differential equation • Reducible higher-order differential equations • High-order linear differential equations • Constant coefficient homogeneous linear differential equation • Coefficient inhomogeneous linear differential equation Chapter 8 Spatial Analytic Geometry and Vector Algebra (14contact hours, 22 self-study hours) • Vectors and their linear operations • Quantity product, vector product, mixed product • Plane and its equations • Space lines and equations

	• Surface and its equations • Spatial curve and its equations Chapter 9 Multivariate Function Differential Method and Its Application(16contact hours, 25 self-study hours) • The basic concept of multivariate function • Partial derivatives • Full differential • The derivation of multiple complex functions • The derivative formula of implicit function • Geometry application of multivariate function differential calculus • Directional derivatives and gradient • The extreme value of multivariate function and its solution Chapter 10 Multiple Integrals (16contact hours, 25 self-study hours) • The concept and properties of double integral • Calculation of double integral • Triple integral • Application of multiple integrals Chapter 11 Curve Integration and Surface Integration (16contact hours, 25 self-study hours) • Integration of arc length curves • Integration of the curve of the coordinates • Green's formula and its application • Surface integral of area • Surface integral of coordinates • Gaussian formula flux and divergence • Stokes formula ring flow and curl Chapter 12 Infinite Series (18 contact hours, 28 self-study hours) • The concept and properties of constant series • Convergence method of constant series • Power series • Functions expanded into power series • Application of power series expansion of function • Fourier series • Fourier series of general periodic functions
Study and examination requirements and forms of examination	The assessment method of "Advanced Mathematics" course is closed book examination. Final exam questions include understanding, analysis, and calculation of concepts and theories. The final assessment results are generally determined by in-class results (including assignments, attendance, tests and mid-term examination results, accounting for 30%) and final assessment results (70%).
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books

	[1] Higher Mathematics (Seventh Edition), Department of Applied Mathematics, Tongji University, Beijing: Higher Education Press, 2014. 2. Reference books [1] Yunrui Han, Zhiming Qi et al., Calculus Tutorial, Beijing: Tsinghua University Press, 2003. [2] Zhijiang Cao, Calculus Tutorial, Beijing: Higher Education Press, 2005. [3] Ganchang Wu, Higher Mathematics (Science, Fourth edition), Beijing: China Renmin University Press, 2011.

Module designation	Basic course
Module level, if applicable	none
Code, if applicable	2800021/2800022
Subtitle, if applicable	none
Courses, if applicable	College physics B (1)(2)
Semester(s) in which the moduleis taught	2nd and 3rd semesters
Person responsible forthemodule	Associate professor Gao lanxiang
Lecturer	Professor Zhu yanyan Lecturer Li pengfei
Language	Chinese
Relation to curriculum	It is the base for studying other course such as theoretical mechanics, fluid mechanics, electrotechnics.
Type of teaching, contact hours	Targeted students: First year undergraduate Type of teaching: theoretical teaching Contact hours: 96 hours
Workload	Workload=240 hours Contact hour=96 hours Self-study hours=144 hours
Credit points	8.0
Requirements according to the examination regulations	Students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Advanced mathematics
Module objectives/intended learning outcomes	Module objectives: With emphasis on College Physics course, students will be familiar with basic ideas of physics methods, students will gain a professional and improved ability to analyze and solve physical problems. intended learning outcomes : On successful learning of this course module, the student should be able to demonstrate the following learning outcomes: ● Knowledge: students are required to master the basic concepts and principles in mechanics, thermophysics and electrostatics. ● Skills: Acquire the ability of abstract thinking. Improve self-study ability. Acquire the ability to

	analyze and solve problems. Capable of computing and judging. Use mathematical tools to solve general problems in physics, calculation and estimation are included. ● Competences: Analyze engineering problems from a viewpoint of physics, and solve problems using knowledge and skills mentioned above.
Content	Theoretical teaching (96 contact hours; 144 self-study hours) Chapter 1 particle kinematics （contact hours 6， self-study hours 8） • time and space • descroption of particle motion • natural coordinate system; • relative motion Chapter 2 particle dynamics （contact hours 6， self-study hours 12） • momentum and law of conservation of momentum • angular momentum and law of conservation of angular momentum; • law of conservation of mechanical energy Chapter 3 rigid-body mechanics（contact hours 8，self-study hours 12） • translation and rotation • rotational inertia • Law of fixed axis rotation of rigid body • Law of conservation rotation of rigid body • law of conservation of mechanical energy of rigid body Chapter 6 Charge and electic field （contact hours 12，self-study hours 18） • Coulomb’s law electric field intensity • Gauss theorem in vacuum • circuital theorem of electrostatic field,potential; • conductor in Electrostatic field Chapter 7 Current and magnetic field （contact hours 8，self-study hours 12） • power and power EMF • magnetic induction intensity • B-S law • Gauss theorem in magnetic field • ampere’s loop theorem in constant magnetic field • magnetic field force Chapter 8 Electromagnetic field and Maxwell’s equations （ contact hours 8， self-study hours 10）

	• Faraday law of electromagnetic induction • motiinal electromotive force • induced electromotive force 、induced electric field • self induction and mutual inductance • magnetic field energy • displacement current • Maxwell's equations Chapter 9Kinetic theory of gases（contact hours 8，self-study hours 12） • status reference • tatus equation of ideal gas • distribution function of Maxwell rate • Pressure of ideal gas • microcosmic nature of temperature • Equipartition theorem of energy • Mean free path and average collision of gas Chapter 10fundamentals of thermodynamics（contact hours 6，self-study hours 10） • First law of thermodynamics • application of First law of thermodynamics • adiabatic process • Cycle process and Carnot's Cycle process • Second law of thermodynamics Chapter 11 fundamentals of vibration（contact hours 6，self-study hours 10） • Simple harmonic vibration • dynamics of Simple harmonic vibration • synchronise of Simple harmonic vibration Chapter 12 wave（contact hours 6，self-study hours 10） Formation of mechanical wave • wave function • Energy of the wave • Huygens principle • Interference of wave • standing wave Chapter 13 optics（contact hours 12，self-study hours 18） Light source and optical path • Young's double slit interference • film interference • Michelson interference • single slit diffraction • grating diffraction • polarized light • Marius law

	• Brewster’s law Chapter 5 Special relativity（contact hours 4，self-study hours 6） • Principle ofSpecial relativity • concept of time and space ofSpecial relativity • relativistic dynamics Chapter 14 Quantum mechanics（contact hours 6，self-study hours 6） • blackbody radiation • photoelectric effect • De Broglie wave
Study and examination requirements and forms ofexamination	Separation of teaching and testing; scores= the score of final exam*70%+daily performance*30%
Media employed	Multimedia computer; laser pointer; projector; blackboard; chalk;
Reading list	Text book: [1] Wang Shaojie, College physics(5th). Beijing: High education Press; 2017. Refenence Book: [1] Chen Zhonghua. College physics learning guidance and ability training(5th). Beijing: High education Press; 2017.

Module designation	Compulsory public Course
Module level, if applicable	Basic course
Code, if applicable	2800023/2800024
Subtitle, if applicable	
Courses, if applicable	Physical Experiment (1) (2)
Semester(s) in which the module is taught	2nd and 3rd semesters
Person responsible for the module	Associate professor Chen Dongsheng
Lecturer	Associate professor Hu Haining Associate professor Zhang jie Associate professor Xiong Huiping Associate professor Zhao Yu Lecturer Wang Ying Lecturer Zhang Sucai Lecturer Yang Chunhu Lecturer Zou qianlin Lecturer Jia Caili Lecturer Wang Huaisheng Lecturer Xing Lirong Lecturer Liu Shijian
Language	Chinese
Relation to curriculum	Physics experiment is an important basic course in engineering colleges. In this course, students can master the basic skills and methods of science experiment. This course aims at improving students' ability to analyze and solve practical problems and cultivating students' innovative spirit and ability.
Type of teaching, contact hours	Target students: freshmen and sophomores majoring in Energy and Power Engineering program Lecture format: Blackboard + practice Type of teaching: experimental teaching Contact hours: 48 hours Of which Theoretical teaching: 4 hours Experimental /practice teaching: 44 hours Size of class: No more than 20 students in the experimental class
Workload	Workload =90 hours Teaching hours =48 hours Self-study hours =42 hours
Credit points	3.0

Requirements according to the examination regulations	Only students with class attendance rate over 2/3, and having completed 8 lab projects per semester are allowed to take the exam.
Recommended prerequisites	Basic physical knowledge of mechanics, thermology, optics and electricity
Module objectives/intended learning outcomes	Through the necessary experimental theory teaching and a series of corresponding typical experiments, students can learn the knowledge, methods and skills of physical experiments in the observation and analysis of experimental phenomena and the measurement of physical quantities, and preliminarily understand the characteristics of scientific experiments. ● Knowlege:Be able to design system function modules and present design results in the form of experimental reports. ● Skills:Be able to design feasible experimental scheme according to the research route, build experimental system and carry out experiments. ● Competences:Based on the designed experimental scheme, can correctly record and process experimental data, drew plot lines, evaluate experimental results, and write qualified experimental reports.
Content	Experimental teaching (90 contact hours, 48 self-study hours) Experiment 1: Determination of Young's modulus of elasticity (6 experiment hours, 3 self-study hours) Experiment 2: The use of multimeter (5 experiment hours, 3 self-study hours) Experiment 3: Measure resistance with Wheatstone bridge (6 experiment hours, 3 self-study hours) Experiment 4: Use a potentiometer to measure the electromotive force of the battery (6 experiment hours, 3 self-study hours) Experiment 5: Spectrometer adjustment and prism vertex Angle measurement (6 experiment hours, 3 self-study hours) Experiment 6: Use of oscilloscope and determination of the natural frequency of tuning fork (5 experiment hours, 3 self-study hours) Experiment: 7 Measure the moment of inertia of an object with three suspension plates (6 experiment hours, 3 self-study hours) Experiment 8: Determination of focal length of thin lens (5 experiment hours, 3 self-study hours)

	Experiment 9: Stationary waves (6 experiment hours, 3 self-study hours) Experiment 10: Forced vibration experiment (6 experiment hours, 3 self-study hours) Experiment 11: Hall effect (5 experiment hours, 3 self-study hours) Experiment 12: Measure low resistance with double arm bridge (6 experiment hours, 3 self-study hours) Experiment 13: Electric meter modification experiment (6 experiment hours, 3 self-study hours) Experiment 14: Determination of radius of curvature of Newton's rings (6 experiment hours, 3 self-study hours) Experiment 15: Determination of volt-ampere characteristic curve of solar cells (5 experiment hours, 3 self-study hours) Experiment 16: Description of electrostatic field (6 experiment hours, 3 self-study hours)
Study and examination requirements and forms of examination	Usually performance
Media employed	various kinds of experimental equipment for mechanics, thermology, optics and electricity
Reading list	[1] Sun Guangdong. Collage Physics Experiment[M]. Beijing: China Water & Power Press, 2007. [2] Zhao Lihua, Ni Yongzhou. New collage Physics Experiment[M]. Hangzhou: Zhejiang University press [3] Du Yilin. College Physics experiment course [M]. Hefei: University of Science and Technology of China Press, 2002.

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2117065
Subtitle, if applicable	
Courses, if applicable	Engineering Mechanics
Semester(s) in which the moduleis taught	2nd semester
Person responsible forthemodule	Associate professor LIU Jianfeng
Lecturer	Professor JI Dongmei Lecturer LI Min
Language	Chinese
Relation to curriculum	Engineering Mechanics is one of the main courses for undergraduates of Energy and Power Engineering program. This course mainly utilizes mathematical deduction. It is not only a reasoning, but also a calculation tool that reflects the quantitative relationship among mechanics. The study of this course requires students to be proficient in using balance theory to analyze and solve the balance problems inengineering systems. Students should master the basic concepts of material mechanics, the calculation methods for strength and stiffness of rods under various deformations, the strength design method of components under complex stress, the stability analysis of rods, and be able to use the theory to solve practical engineering problems.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Theoretical teaching: 48 hours
Workload	Workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed
Recommended prerequisites	Calculus; College Physics
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand the basic principles of statics and the research methods of

	material mechanics through teaching. Specific objectives include: ● Knowledge: Master basic knowledge and theoriesrequired by statics and material mechanics. Understand concepts and axioms of statics, the basic concepts of material mechanics, the calculation methods for strength and stiffness of rods under various deformations, the strength design method of components under complex stress, the stability analysis of rods. ● Skills: Students acquire basic theoretical about theprinciple of statics and specialized knowledge about material mechanics. Understand the theory and methods of applying statics and material mechanics. Learn how to analyze and solve simple engineering practical problems. ● Competences: Students acquire practical abilities and innovative thinking on the basis principle of statics and the research method of material mechanics.
Content	1. Theoretical teaching (48 contact hours, 42 hours self-study) Chapter 1 Basics of Statics (4 contact hours, 2 hours self-study) • Force and moment • Force couple • Constraint and binding force • The balance • Force analysis method and process Chapter 2 Simplification of force system (4 contact hours, 4 hours self-study) • The concept of force system equivalence and simplification-principal vector and principal moment • The force system simplification-translated to a point • Simplification of the plane force system • The binding force of the fixed end Chapter 3 The static balance of engineering components (4 contact hours, 4 hours self-study) • Balance condition and equation of plane force system • Simple rigid body balance problem • The balance problem in friction Chapter 4 Basic concepts of material mechanics (4 contact hours, 4 hours self-study) • The task of material mechanics • Basic assumption of solid deformation • Internal force, stress and section method • Displacement, deformation and strain

	• The basic form of rod deformation Chapter 5 Internal force diagram of the rod (4 contact hours, 4 hours self-study) • Basic concepts and methods of internal force diagram • Axial force diagram on the cross section during axial tension and compression • Torque diagram when the round shaft is twisted • Shear force diagram and bending moment diagram Chapter 6 Stress analysis and strength design of tension and compression members (4 contact hours, 4 hours self-study) • Deformation assumption of axial tension and compression • Stress on the cross section • Mechanical properties of the material during stretching and compression • Failure, safety factor and strength calculation • Deformation during axial stretching or compression • Uncertainty in tension and compression • The concept of stress concentration Chapter 7 Strength of the beam (6 contact hours, 4 hours self-study) • Pure bending and transverse bending of the beam • Normal stress during pure bending • Calculation of normal stress and strength during transverse bending • Bending shear stress • Measures to improve bending strength Chapter 8 Beam displacement analysis and stiffness design (6 contact hours, 4 hours self-study) • Deflection and corner • Approximate differential equation of flexure curve • Use integral to find bending deformation • Find bending deformation by superposition • Simple static indefinite beam • Measures to improve bending rigidity Chapter 9 Stress and deformation analysis and strength stiffness design when the round shaft is twisted (4 contact hours, 4 hours self-study) • Calculation, torque and torque diagram of external force torch • The assumption of a flat section with a torsion of the circular axis • Pure shear, shear stress reciprocity theorem, shear Hooke's law

	• Stress when the round shaft is twisted • Deformation when the round shaft is twisted • Stress and strain of cylindrical dense-coil spiral spring • The concept of a torsion with a rectangular cross-section. Chapter 10 Strength design of components under complex stress (4 contact hours, 4 hours self-study) • Combination deformation and superposition principle • Combination of stretching or compression and bending • Combination of torsion and bending Chapter 11 Stability analysis and design of pressure bar (4 contact hours, 4 hours self-study) • The concept of pressure bar stability • The critical pressure of the slender compression rod hinged at both ends • Critical pressure of the pressure bar under other support conditions • Scope of application of Euler's formula Empirical formula • Stable check of the pressure bar • Measures to improve the stability of the pressure bar
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (70%).
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] FANQinshan. Engineering Mechanics. Beijing: Mechanical Industry Press, 2007. 2. Reference books [1] Department of Theoretical Mechanics, Harbin Institute of Technology. Theoretical mechanics. Beijing: Higher Education Press, 2010. [2] FANQinshan. Mechanics of Materials. Higher Education Press. [3] QIUDihua. Mechanics of Materials. Higher Education Press, 2004.

Module designation	Public basic courses
Module level, if applicable	
Code, if applicable	2800007
Subtitle, if applicable	
Courses, if applicable	Linear Algebra
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	Professor Zhu Fenglin
Lecturer	Associate professor Deng Yunping Associate professor Wang Gexia Associate professor Xue Wenjuan Lecturer Liu Jiaxiong Lecturer Zhu Wei
Language	Chinese
Relation to curriculum	The solution of complex linear equations in the field of dynamic specialty is based on matrix theory. Linear algebra studies the basic theory and method of matrix. Only by learning linear algebra and matrix theory can we better understand and master control theory.
Type of teaching, contact hours	Lecture form: Theory Teaching and class discussion Teaching time: 26 class hours Class discussion time: 6 class hour
Workload	Workload= 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required homework are allowed to take the exam.
Recommended prerequisites	High school mathematics
Module objectives/intended learning outcomes	Module objectives: Linear algebra is a common fundamental courses of engineering. It is widely used in modern mathematics. It plays an important role in the related subjects. ● Knowledge: The theory of linear algebras mainly includes the theory of matrices, determinant, system of linear equations, vector spaces, eigenvalues and eigenvectors, quadric forms.

	● Skills: Through learning, students are able to understand the definition and properties of determinant and calculate the determinant; master the operations between matrices; be familiar with some special matrices, such as diagonal matrices, symmetrical matrices, antisymmetric matrices, invertible matrices, orthogonal matrices, positively definite matrices; understand the linear dependence and linear independence of vectors ; master the structure of all the solutions of linear equations and find all solutions of system of linear equations; computing eigenvalues and eigenvectors of square matrices;master the method of diagonalization of matrices; give the normal orthogonal basis in n-dimensional linear space; familiar with quadric forms and their representations by matrices; transform the quadratic forms to their standard forms. Module objectives: Linear algebra is a common fundamental courses of engineering. It is widely used in modern mathematics. It plays an important role in the related subjects. ● Competences: On successful learning of this course students will master the basic theory and method of linear algebra, and improve the abilities to solve the practical problems.
Content	Theoretical teaching (32 contact hours; 28 self-study hours) Chapter 1 Determinant (5 contact hours; 5 self-study hours) • overview of determinant • Full Permutation and transposition • definition and properties of determinant • the determinant is expanded by row (column) • Cramer's law Chapter 2 matrix and its operation (5 contact hours; 4 self-study hours) • definition of matrix • operation of matrix • inverse matrix of square matrix • block matrix • application of matrix multiplication • linear transformation Chapter 3 the elementary transformation of matrix and the solution of linear equations (5 contact hours; 4 self-study hours) • elementary transformation of matrix • rank of matrix • system of linear equations: judgment and solution of

	Solutions Chapter 4 vector group and vector space(7 contact hours; 7 self-study hours) • vector group and its linear combination • linear correlation of vector group • rank of vector group • structure of solutions of linear equations • vector space • inner product, length and orthogonality of vector Chapter 5 eigenvalues and eigenvectors(5 contact hours; 4 self-study hours) • introduction: Transformation of a system state • eigenvalues and eigenvectors • diagonalization of matrices Chapter 6 quadratic form(5 contact hours; 4 self-study hours) • quadratic form and its matrix representation • canonical form of quadratic form • positive definite quadratic form and positive definite matrix
Study and examination requirements and forms of examination	Process assessment：Final score includes: usual performance（Results of flipped course） (20%); final exam (Final exam results) (40%). Online sharing course results (40%). Usual performance includes: assignment and attendance and doing questions online etc.
Media employed	Multimedia computers, projector, notebook computer, iPad, mobile phone, blackboard, chalks
Reading list	1. Required books [1] Wang Xi，Zhu Fenglin, Sun Yuqin et al. Linear algebra [M]. Beijing: Higher Education Press, 2018. 2. Reference books [1] Department of mathematics, Tongji University. Linear algebra (Sixth Edition) [M]. Beijing: Higher Education Press, 2013. [2] Guo Yuqi et al. Linear algebra guidance [M]. Beijing: Science Press, 2001. [3] Sheldon Axler, Du Xiankun, Ma Jing translation. Linear algebra should learn this way (Second Edition) [M]. Beijing: people post and Telecommunications Press, 2009.

Module designation	Public Fundamentals
Module level, if applicable	
Code, if applicable	2800009
Subtitle, if applicable	
Courses, if applicable	Possibility
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	Associate Professor WANG Xi
Lecturer	Associate processor HU Yan Lecturer ZHU Wei Lecturer YU Na Lecturer LIU Ailan
Language	Chinese
Relation to curriculum	At the end of the course, students can obtain the theoretical basis for further study of relevant courses. The application scope of this course involves environmental detection, quality management, signal processing, scientific decision-making, product development and other fields, which is the technical basis of many disciplines.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 32 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Calculus
Module objectives/intended learning outcomes	Module objectives: A prime objective of the course sequence is to present techniques and basic results of probability and mathematical statistics at a rigorous and advanced calculus level. We develop the probabilistic tools and language of mathematical statistics. The course describes probabilistic models for and

	properties of random variables and vectors, moments and common probability distributions. The theory of estimation, confidence sets and hypothesis testing for common parametric models are investigated. ● Knowledge: Understand the axiomatic approach to probability, counting and combinatorial methods, and Bayes' Theorem. Understand random variables and their properties, including marginal and conditional distributions, expectation, conditional expectation, covariance and correlation, moment generating functions, and distributions of functions of one or more random variables. Recognize and learn the properties of important probability distributions. ● Skills: Gain the ability to prove results in probability.Use statistical software to simulate random phenomena and to carry out probability computations for standard distributions. ● Competences: Upon successful completion of this course, students will be able to study, correctly apply and interpret different statistical multivariate methods.
Content	Theoretical teaching (32 contact hours; 28 self-study hours) Chapter 1 Random experiments and random events (6 contact hours; 6 self-study hours) • Random trials and random events • Relation and operation of events • Frequency and probability of events • Axiomatic definition and properties of probability • Conditional probability, total probability formula and Bayesian formula • Mutual independence of events • Bernoulli trials Chapter 2 Random variables and their distribution (8 contact hours; 6 self-study hours) • Random variable • Discrete random variable and its distribution • Distribution function of random variables and continuous random variables • Functions of random variables Chapter 3 Two-dimensional random variables and their Distribution (8 contact hours; 6 self-study hours) • Multidimensional random variables and events represented by multidimensional random variables • Multidimensional discrete random variable • Two dimensional continuous random variable • Distribution of functions of random variables

	Chapter 4 Numerical characteristics of random variables (6 contact hours; 6 self-study hours) • Mathematical expectation of random variables • Variance of random variables • Covariance and correlation coefficient of random variables • Moment and covariance matrix Chapter 5 Law of large numbers and central limit theorem (4 contact hours; 4 self-study hours) • Law of large numbers • Central limit theorem
Study and examination requirements and forms of examination	Final score includes: usual performance (30%); final exam (closed book written examination) (70%). Usual performance includes: experiment process and experiment assignment
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Reference books [1] SHENG Zhou, XIE Shiqian, PAN Chengyi. Probability and mathematical statistics.Beijing, Higher Education Press,2008 [2] MAO Shisong, CHENG Yiming, PU Xiaolong. Course of probability and mathematical statistics.Beijing, Higher Education Press,2011

Module designation	Engineering Fundamentals
Module level, if applicable	Professional basic courses
Code, if applicable	2117005
Subtitle, if applicable	
Courses, if applicable	Fundamentals of mechanical design
Semester(s) in which the module is taught	4th semester
Person responsible for the module	Associate professor HAN Qingpeng
Lecturer	Associate processor WU Maoliang Lecturer YANG Feng
Language	Chinese
Relation to curriculum	Fundamentals of mechanical design is one of the main courses for undergraduates of Energy and Power Engineering program. Basis of mechanical design: conceive, analyze and calculate the working principle, structure, motion mode, transfer mode of force and energy, material, shape and dimension of each part, lubrication method, etc. of the machine according to the use requirements, and convert them into specific description as the working process of manufacturing basis.It includes the introduction, structural analysis of planar mechanism, planar linkage mechanism, cam mechanism, intermittent motion mechanism, mechanical speed regulation and balance, connection, flexible transmission, meshing transmission, gear train, shaft, bearing, coupling, clutch, brake, spring and other chapters.
Type of teaching, contact hours	Targeted students: Sophomore of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching Contact hours: 48 hours Of which Theoretical teaching: 48 hours
Workload	Workload=90 hours Contact hours = 48 hours Self-study hours =42hours
Credit points	3
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended	Mechanical drawing, engineering mechanics, engineering

prerequisites	materials.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand mechanical design process and basic theories though teaching and practice. Specific objectives include: ● Knowledge: Master basic knowledge and theories required by mechanical design technology.Its task is to enable students to master the basic theory and basic knowledge of common mechanism and common parts, preliminarily have the ability of analysis and design in this respect, and obtain the necessary basic skills training, and pay attention to training students' correct design ideas and rigorous work style. Because of the characteristics of this course, it not only establishes the foundation for learning the follow-up courses, but also for solving the practical problems of production. ● Skills: Students acquire basic theoretical and specialized knowledge about mechanical design. The students should be familiar with the working principle, composition and characteristics of common mechanisms, and master the basic methods of analysis and design of common mechanisms; The students should be familiar with the working principle, structure and characteristics of general mechanical parts, and master the basic methods of selection and design of general mechanical parts; ● Competences: Students acquire practical abilities and innovative thinking on the basis of mechanical design theories and engineering technology knowledge. It make the students have the ability to use the knowledge and practice comprehensively, design simple machinery and simple transmission device. The students should have the ability to identify common mechanism composition, working characteristics and structural characteristics of general mechanical parts through experiment and observation.
Content	1. Theoretical teaching (48 contact hours; 42 self-study hours) Chapter 1 Introduction (2 contact hours, 2 self-study hours)) Chapter 2 Basic knowledge of mechanical design (2contact hours; 2 self-study hours)) Chapter 3 Plane mechanism and its degree of freedom (4 contact hours; 4 self-study hours) • Kinematic diagram of plane mechanism*

	• Freedom of planar mechanism* * • Velocity analysis of planar mechanism* Chapter 4 Planar linkage mechanisms (6 contact hours; 4 self-study hours) • Characteristics and application of planar linkage* • Basic types and evolution of planar four-bar mechanism* * • Working characteristics of planar four-bar mechanism* • Design of plane four-bar mechanism* Chapter 5 Cam mechanism (4 contact hours; 4 self-study hours) • Application and classification of cam mechanism * • Common motion law of follower* • Graphic design of cam profile* • Determination of basic dimensions of disc cam mechanism* * Chapter 6 Intermittent motion mechanism (1 contact hours; 1 self-study hours)* Chapter 7 Gear transmission (9 contact hours; 9 self-study hours) • Characteristics and types of gear * • fundamental law of gearing* * • Basic parameters and geometric dimensions of involute spur gears * • Material and manufacture of gear* * • Failure forms and design criteria of gears * • Design and calculation of spur gear transmission* * • worm drive* * Chapter 8 Gear train (4 contact hours; 4 self-study hours) Type of gear train* • Transmission ratio calculation of fixed axle gear train* • Transmission ratio calculation of epicyclic gear train* * Chapter 9 Belt drive and chain drive (4 contact hours; 4 self-study hours) • Types and characteristics of belt drive * • analysis of working conditions of belt drive* * • analysis of working conditions of belt drive* • Design of V-belt drive * • v pulley structure* * • v belt drive tensioning device* Chapter 11 Connection(4 contact hours; 4 self-study hours) Thread* • Stress analysis, efficiency and self-locking of screw pairs* • Basic types of threaded connections and threaded fasteners* *

	• Pre tightening and anti loosening of threaded connection* • Strength calculation of bolt connection* • ey and spline connection * • Pin connection* * Chapter 12 Rolling bearing (4contact hours; 4 self-study hours) • main types of rolling bearing * • code of rolling bearing * * • type selection of rolling bearing* • size selection of rolling bearing* Chapter 13 Sliding bearing (1 contact hours; 1 self-study hours) Chapter 14 Shaft (3 contact hours; 2 self-study hours) Chapter 15 Coupling, clutch and brake (2contact hours; 2 self-study hours)
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); final exam (closed book written examination) (70%). Usual performance includes: assignment and attendance
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] YANG Kezhen, CHENG Guangyun, LI Zhongsheng. Fundamentals of mechanical design. Beijing: Higher Education Press Press, 2013 2. Reference books [1] BI Jiangping. Fundamentals of mechanical design. Zhengzhou: Zhengzhou University Press, 2008 [2] GUO Rensheng. Fundamentals of mechanical design. Beijing: Tsinghua University Press, 2006 3. Experiment/computer practice instruction books 4. Other materials [1] PPT courseware (self-compiled)

Module designation	
Module level, if applicable	
Code, if applicable	2600096
Subtitle, if applicable	
Courses, if applicable	Electrical and electronic technology (1)
Semester(s) in which the moduleis taught	Third semester
Person responsible forthemodule	Hu Andu
Lecturer	Bian Zhenglan Zhao Ping
Language	Chinese
Relation to curriculum	This course is an important part of the knowledge structure of non-electric students. By studying the course, the students acquire the basic theory, basic knowledge and basic skills of electrician and electronic technology, and lay a certain foundation for learning the follow-up course and engaging in the engineering and technical scientific research work of their major.
Type of teaching, contact hours	Lectures: theoretical lectures, experiments Teaching hours :48 hours Theoretical teaching time :38 hours Experimental hours :10 hours
Workload	Course hours =48 hours
Credit points	3.0
Requirements according to the examination regulations	Students need to participate in more than two-thirds of the class, Work done more than two thirds, Allow to take the exam after completing the experimental section required by the course
Recommended prerequisites	Advanced Mathematics Engineering Mathematics
Module objectives/intendedle arning outcomes	Through theoretical teaching and experimental training in this course, students have the following abilities. ● Knowledge: master the basic theory, basic knowledge and basic analysis method of electrician and electronic technology. ● Skills:Understand the analysis method of circuit and electronic technology, the angle of thinking, understand the new technology and new knowledge in the field of

	electrician and electronic technology. ● Competences:Improve the students' ability of practical electricity technology, and can use the electrical knowledge to analyze and solve problems in engineering practice and daily life.
Content	I. The theoretical part (38 lectures) 1. circuit and its analysis method (14 class hours) （1） Circuit Composition and Circuit Model （2） Reference direction of voltage and current （3） Working state of power supply （4） Kirchhoff's Law （5） Branch Current Method （6） superposition theorem （7） Two Models of Power Supply and their Equivalent Transformations （8） Davining Theorem （9） Calculation of potential in circuit （10） Three Element Method for Circuit Transient Analysis 2. circuit and its analysis method (8 class hours) （1） sinusoidal voltage and current （2） Phasor representation of sinusoidal quantities （3） AC circuit with single parameter （4） AC circuit in series of resistors, inductors and capacitive elements （5） Increase in power factor （6） Three-phase circuit 3. magnetic circuits and transformers (4 class hours) （1） Magnetic Path and Analysis Method （2） AC coil circuit （3） Transformer 4. motor (4 class hours) （1） Construction of Three-phase Asynchronous Motor （2） Working principle of three-phase asynchronous motor （3） Circuit Analysis of Three-phase Asynchronous

	Motor （4） Torque and Mechanical Characteristics of Three-phase Asynchronous Motor （5） Starting of three-phase asynchronous motor （6） Speed regulation of a three-phase asynchronous motor （7） Brake of three-phase asynchronous motor （8） Nameplate data for three-phase asynchronous motors （9） Single-phase asynchronous motor 5. enterprise power supply and safe electricity (2 class hours) （1） Overview of generation, transmission and distribution （2） Safe Electricity （3） Saving Electricity 6. Electrical Measurement (2 class hours) （1） Measurement of current （2） Measurement of voltage （3） Digital multimeter （4） Power measurement II. Exercise section (4 class hours) III. EXPERIENCES PART (10 lecture hours) Kirchhoff's law and superposition principle. (2) Research on circuit potential (designability). (3) Transient analysis of RC first-order circuits. (4) Effect of shunt capacitance on power factor. (5) Research on three-phase circuits.
Study and examination requirements and forms ofexamination	Average performance (30 per cent)+ final exam (70 per cent) Performance includes: class attendance (10%)+ class participation (10%)+ after-class assignments (10%)
Media employed	Multimedia, projector, laser pen, blackboard, chalk
Reading list	Textbook :1, edited by Qin Zenghuang. Brief course in Electrical Engineering (3rd Edition), Beijing: higher Education Press, March 2015. 2、Electronic Teaching and Research Department of

	Electrical College. Reference Books: 1. Qin Zenghuang. Electrotechnics (first volume)(5th edition). Beijing: Higher Education Press ,1999.9. 2. Tang Jie. Electrical Engineering (less hours)(3rd Edition). Beijing: higher Education Press ,2009. 3. Zhang Wensheng. Electrical engineering (first volume) electrical technology. Beijing: China Electric Power Press ,2007.2.

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2600097
Subtitle, if applicable	
Courses, if applicable	Electrical and Electronic Technology (1)
Semester(s) in which the moduleis taught	3rd semester
Person responsible forthemodule	HU Anduo
Lecturer	BIAN Zhenglan ZHAO Ping
Language	Chinese
Relation to curriculum	Electrical and Electronic Technology(2)is one of the important professional courses in energy and power science and engineering. It plays a supporting role in achieving the knowledge, skills and quality objectives required by the energy and power engineering specialty. Based on the needs of engineering practice,This course mainly introduces the basic concepts and theories of electronic circuit, including analog electronic technology and digital electronic technology.After learning this course, students have certain experimental ability and practical ability of electronic circuit, and can design electronic circuit with simple integrated circuit module.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, Experiment teaching Contact hours: 32hours Of which Theoretical teaching:26 hours Experiment / practice teaching: 6 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 48hours Contact hours = 32 hours Self-study hours =16 hours
Credit points	2.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Advanced mathematics, Electrical and Electronic Technology(2),College Physics

Module objectives/intended learning outcomes	Overall objectives: Through the study of this course, students should have the basic knowledge, basic theory and basic skills of electronic technology;Students have a preliminary understanding of the basic ideas and methods of studying electronic technology;Students' comprehensive quality has been improved in an all-round way;This course can cultivate students' ability to apply technical knowledge, improve their professional quality and cultivate their innovative consciousness. ● Knowledge: Acquire basic concepts and engineering knowledge of electronic technology; Master the analysis methods of engineering problems such as analog electronic technology and digital electronic technology; 1、Can detect and identify common diodes, triodes, voltage regulators and other common components. 2、Can analyze and design the basic principle of common analog electronic circuits, such as basic operational amplifier circuit, integrated operational amplifier, DC stabilized power supply; 3、Can analyze and design the basic principle of combinational logic circuit and sequential logic circuit. ● Skills:Have the ability of modern electronic technology engineer;Can abstract the concrete practical application into the mathematical relation with clear concept;Be able to use modeling method to build algebraic model of the system;Be able to analyze system characteristics and performance parameters by system analysis method;Be able to use system design method to preliminarily design electronic circuit meeting application requirements;Preliminary ability to analyze and design complex engineering problems. ● Competences: Set up the thinking mode of system analysis problems, and understand the application of electronic circuit theory in energy and power industry.Cultivate the spirit of self-study and team work to lay a good foundation for future engineering design, operation, debugging, maintenance, technology development and management in the field of Engineering technology.
Content	I.Theoreticalteaching (26 contact hours; 16 self-study hours) ChapterOne: Semiconductor diodes and triodes(3contact

	hours, 1self-study hours) 1.Conductivity of semiconductor, PN junction; 2. The structure, working principle, characteristic curve and main parameters of diode; 3.The structure, current amplification, characteristic curve and main parameters of bipolar transistor; 4. Structure and characteristics of voltage regulator and photoelectric device. Chapter Two:the basic amplifying circuit(5contact hours, 3 self-study hours) 1.Static analysis, dynamic analysis, graphic analysis and micro variation equivalent circuit method of basic amplifier circuit ; 2. Stability of static working point; 3. Characteristics of emitter output device. Chapter Three:Integrated operational amplifier(4contact hours, 2 self-study hours) 1. Analysis basis of operational amplifier working in linear region; 2. The type of negative feedback in amplifying circuit and the influence of negative feedback on the performance of amplifier circuit; 3. Application of operational amplifier in signal operation; Chapter Four:DC regulated power supply(2contact hours, 1self-study hours) 1. Working principle, quantitative calculation and component selection of rectifying circuit; 2. Working principle of capacitor filter circuit and voltage stabilizing circuit . Chapter Five:Gate circuit and combinational logic circuit(6contact hours, 3 self-study hours) 1. Switching function of transistor, basic logic gate circuit, logic algebra; 2. Functions of adder, encoder, decoder and display decoder; 3. Analysis of combinational logic circuit ; 4. Design of combinational logic circuit. Chapter Six:Flip flops and sequential logic circuits(6contact hours, 3 self-study hours) 1. Logic function of bistable flip flops (R-S flip flop, J-K flip-flop, D-flip-flop);

	2. Working principle and comprehensive analysis of counter ; II. Experiment/practice teaching (6 experiment hours, 3 self-study hours) 1.Experiment of single tube amplifier; 2.Experiment of single phase half wave rectification and voltage regulator; 3.Design experiment of combinational logic circuit.
Study and examination requirements and forms ofexamination	Final score includes: usual performance (15%); homework (15%), final exam (closed book written examination) (70%). Usual performance includes: assignment and attendance
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1]Qinzenghuang.< Concise course of Electrotechnics> (Third Edition), Beijing: Higher Education Press, March 2015 [2]<Electrotechnics experiment instruction>, compiled by electronic teaching and research section of electrical College 2. Reference books [1] Tang Jie, Liu Yunhong. <Electrotechnics (less class hours)>. 4th Edition, Beijing: Higher Education Press, July 2014. [2]Ye Cui. <Electrical and electronic technology>. Beijing: Chemical Industry Press, 2000.8

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2600097
Subtitle, if applicable	
Courses, if applicable	Electrical and Electronic Technology (2)
Semester(s) in which the moduleis taught	4th semester
Person responsible forthemodule	Lecturer Jing Liu
Lecturer	Lecturer Qian Zhao Lecturer Xiaohua Wang Lecturer Chunjuan Wei Lecturer Qiong Huang
Language	Chinese
Relation to curriculum	Electrical and Electronic Technology (2) is one of the important professional courses in energy and power science and engineering. It plays a supporting role in achieving the knowledge, skills and quality objectives required by the energy and power engineering specialty. Based on the needs of engineering practice, this course mainly introduces the basic concepts and theories of electronic circuit, including analog electronic technology and digital electronic technology.After learning this course, students have certain experimental ability and practical ability of electronic circuit, and can design electronic circuit with simple integrated circuit module.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, Experiment teaching Contact hours: 32 hours of which Theoretical teaching:26 hours Experiment / practice teaching: 6 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 60 hours Contact hours = 32 hours Self-study hours =28 hours
Credit points	2.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.

Recommended prerequisites	Advanced mathematics, Electrical and Electronic Technology (1), College Physics
Module objectives/intended learning outcomes	Overall objectives: Through the study of this course, students should have the basic knowledge, basic theory and basic skills of electronic technology; Students have a preliminary understanding of the basic ideas and methods of studying electronic technology; Students' comprehensive quality has been improved in an all-round way; This course can cultivate students' ability to apply technical knowledge, improve their professional quality and cultivate their innovative consciousness. ● Knowledge objectives: Acquire basic concepts and engineering knowledge of electronic technology; Master the analysis methods of engineering problems such as analog electronic technology and digital electronic technology; 1、Can detect and identify common diodes, triodes, voltage regulators and other common components. 2、Can analyze and design the basic principle of common analog electronic circuits, such as basic operational amplifier circuit, integrated operational amplifier, DC stabilized power supply; 3、Can analyze and design the basic principle of combinational logic circuit and sequential logic circuit. ● Skills:Have the ability of modern electronic technology engineer;Can abstract the concrete practical application into the mathematical relation with clear concept;Be able to use modeling method to build algebraic model of the system;Be able to analyze system characteristics and performance parameters by system analysis method;Be able to use system design method to preliminarily design electronic circuit meeting application requirements;Preliminary ability to analyze and design complex engineering problems. ● Competences:Set up the thinking mode of system analysis problems, and understand the application of electronic circuit theory in energy and power industry. Cultivate the spirit of self-study and team work to lay a good foundation for future engineering design, operation, debugging, maintenance, technology development and management in the field of Engineering technology.
Content	I.Theoreticalteaching (26 contact hours; 25 self-study hours)

	Chapter 1 Semiconductor diodes and triodes (3contact hours, 3 self-study hours) • Conductivity of semiconductor, PN junction • The structure, working principle, characteristic curve and main parameters of diode • The structure, current amplification, characteristic curve and main parameters of bipolar transistor • Structure and characteristics of voltage regulator and photoelectric device Chapter 2 the basic amplifying circuit (5contact hours, 5 self-study hours) • Static analysis, dynamic analysis, graphic analysis and micro variation equivalent circuit method of basic amplifier circuit; • Stability of static working point • Characteristics of emitter output device Chapter 3 Integrated operational amplifier (4contact hours, 4 self-study hours) • Analysis basis of operational amplifier working in linear region • The type of negative feedback in amplifying circuit and the influence of negative feedback on the performance of amplifier circuit • Application of operational amplifier in signal operation Chapter 4 DC regulated power supply (2contact hours, 2 self-study hours) • Working principle, quantitative calculation and component selection of rectifying circuit • Working principle of capacitor filter circuit and voltage stabilizing circuit Chapter 5 Gate circuit and combinational logic circuit (6contact hours, 5 self-study hours) • Switching function of transistor, basic logic gate circuit, logic algebra • Functions of adder, encoder, decoder and display decoder • Analysis of combinational logic circuit • Design of combinational logic circuit Chapter 6 Flip flops and sequential logic circuits (6contact hours, 6 self-study hours) • ` II. Experiment/practice teaching (6 experiment hours, 3 self-study hours) 1.Experiment of single tube amplifier;

	2.Experiment of single-phase half wave rectification and voltage regulator; 3.Design experiment of combinational logic circuit.
Study and examination requirements and forms ofexamination	Final score includes: usual performance (15%); homework (15%), final exam (closed book written examination) (70%). Usual performance includes: assignment and attendance
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Zenghuang Qin. Concise course of Electrotechnics (3rd Edition), Beijing: Higher Education Press, 2015. [2] Electrotechnics experiment instruction, compiled by electronic teaching and research section of electrical College. 2. Reference books [1] Jie Tang, Yunhong Liu. Electrotechnics (less class hours). 4th Edition, Beijing: Higher Education Press, 2014. [2] Cui Ye. Electrical and electronic technology. Beijing: Chemical Industry Press, 2000.

Module designation	Basic course
Module level, if applicable	none
Code, if applicable	2800177
Subtitle, if applicable	none
Courses, if applicable	Computational methods
Semester(s) in which the moduleis taught	3rd and 4th semesters
Person responsible forthemodule	Associate Professor Zhang kaijun
Lecturer	Lecturer HUANG jianxiong Lecturer DENG huayu Lecturer ZHUu xiaojing
Language	Chinese
Relation to curriculum	Basic course. It is the base of others course.
Type of teaching, contact hours	Target students: sophomore majoring in energy and power engineering Type of teaching: theory teaching, computer teaching Contact hours: 64 hours Of which Theoretical teaching: 60 hours Experiment / practical teaching: 4 hours Size of class size: No more than 60 students in theory class
Workload	Total work = 60 hours Contact hours = 32 hours Self-studying hours = 28 hours
Credit points	2.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required homework are allowed to take the exam.
Recommended prerequisites	Advanced mathematics, Linear algebra
Module objectives/intended learning outcomes	To know and understand the basic ideas, algorithms, theories, and concepts; To do some programs by computers. To develop the abilities to get new algorithms and new theories.
Content	Theoreticalteaching (32 contact hours; 28 self-study hours) Chapter 1 Science computation and Matlab （4 contact hours，6 self-study hours） • Meaning of science computation

	• Error analysis • Matlab software Chapter 2 The direct solution to the systems of linear algebra（4 contact hours，6 self-study hours） • Gauss Elimination • The triangle factorization Chapter 3 Polynomial interpolations and splines（6 contact hours，8 self-study hours） • Polynomial interpolations • Lagrange interpolation • Newton interpolation • Hermite interpolation • Spline interpolation Chapter 4 Numerical Approximation （t4 contact hours，6 self-study hours） • Inner product and orthogonal polynomials • The best uniform approximation • The best square approximation • The least square method Chapter 5 Numerical integration （3 contact hours，4 self-study hours） • The ordinary integration formula and compound formula • The varied step and extrapolation technique Chapter 6 The iterative method for the systems of linear algebra（4 contact hours，4 self-study hours） • Normal and condition numbers • Basic iterations Chapter 7 The root of the nonlinear functions （4 contact hours，8 self-study hours） • The basic problem • Dichotomy • Fixed point method • Newton method Chapter 9 The numerical solution to the ordinary differential equations with initial boundary condition （3 contact hours，6 self-study hours） • The Eulor methods and its modified formula • The Runge-Kutta methods
Study and examination requirements and forms ofexamination	scores= the score of midterm exam*20%+the score of final exam*40%+the score of practical programming 20%+daily performance*20%
Media employed	Multimedia computer, Laser point, Projector, Blackboard.
Reading list	Textbooks

	[1] Advanced Numerical Computing(2nd). Posts and Telecom press, 2014. [2] Training in methods of numerical computations. Xu li, Zhang kaijun, Deng huayu. Shanghai university of Electric Power , 2013. Reference book: [1] Li qingyang, Wang nengchao, Yi dayi. Numerical analysis. Beijing: Tsing-hua University Press, 2008. [2] Guan Zhi, Lu Jingpu.Fundamentals of Numerical Analysis. Beijing: Higher education press, 1998. [3] Bai fengshan.Introduction to numerical computaton. Beijing: Higher education press,2004. [4] Xiao younan, Zhao laijun, Dang linli. Advanced methods of numerical computations. Beijing: Peking University Press, 2003. [5] Richard L. Burden and J. Douglas Faires. Numerical Analysis. Nine Edition. Brooks/Cole Cengage Learing, 2011. [6] Timothy Sauer. Translator: Pei yuru, Ma gengyu. Numerical Analysis(2nd). Beijing: China machine press,2014.

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2200163
Subtitle, if applicable	
Courses, if applicable	General Chemistry B
Semester(s) in which the module is taught	4th semester
Person responsible for the module	Associate Professor
Lecturer	Professor Lecturer Lecturer Lecturer
Language	Chinese
Relation to curriculum	This course is the basic course and introductory course of college chemistry, which is the basis for the subsequent related basic courses and professional courses.
Type of teaching, contact hours	Target students: sophomore majoring in energy and power engineering Type of teaching: theory teaching Contact hours: 32 hours Of which Theoretical teaching: 32 hours Size of class: No more than 60 students in theory class
Workload	Workload= 90 hours Contact hours = 32 hours Self-study hours = 58 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Advanced mathematics
Module objectives/intended learning outcomes	Module objectives: While learning the basic theory, basic knowledge and basic skills of this course, it is required to understand the application of these theoretical knowledge and skills in the major of energy, machinery and related engineering, so that the theoretical knowledge and practice can be closely linked. Specific objectives include:

	● Knowledge: Master the basic theory, knowledge and skills of the state of substance, chemical thermodynamics, chemical equilibrium, chemical reaction rate and coordination chemistry. ● Skills: It is necessary to combine theoretical knowledge with practice closely, cultivate a serious and realistic scientific attitude, and cultivate students' ability to analyze and solve problems independently, so as to lay a certain chemical foundation for the study of follow-up courses and future work. ● Competences: Master the relationship and calculation of the four equilibria in solution. Based on the periodic law, we can master the atomic structure, molecular structure and crystal structure of matter, so as to understand the change of physical and chemical properties of matter and its application in practice.
Content	1. Theoretical teaching (32 contact hours; 58 self-study hours) Chapter 1 thermochemistry and energy (5 contact hours; 10 self-study hours) • The process of mutual conversion of heat and mechanical energy • The basic contents of the first law, the second law and the third law of thermodynamics • Various calculation methods of standard molar enthalpy change of chemical reaction • Calculation method of standard molar entropy change of chemical reaction • Calculation method of standard molar Gibbs free energy change of chemical reaction Chapter 2 Chemical equilibrium and reaction rate (5 contact hours; 10 self-study hours) • Characteristics of chemical equilibrium • Expressions of standard equilibrium constants for different types of reactions • Calculation of standard equilibrium constant by multiple equilibrium rules • Mass action law and rate equation for determining non elementary reactions Chapter 3 Acid base equilibrium and precipitation dissolution equilibrium (5 contact hours; 9 self-study hours) • acid-base theory • Dissociation reaction of weak electrolyte • Buffer solution and pH calculation • Equilibrium of precipitation and dissolution Chapter 4 Electrochemistry and metal corrosion (6 contact

	hours; 9 self-study hours) • Basic concept of redox reaction and galvanic cell • Application and application of electromotive force and electrode potential • Overview of electrolysis and metal corrosion Chapter 5 Material structure foundation (8 contact hours; 10 self-study hours) • Modern concept of atomic structure • The distribution of electrons in atoms • Periodicity of atomic properties Chapter 6 Coordination compound (6 contact hours; 10 self-study hours) • Basic concepts of complexes • Overview of valence bond theory • Stability and application of complexes
Study and examination requirements and forms of examination	Final score includes: usual performance (10%); experiment (10%), final exam (80%). Usual performance includes: assignment and attendance and experiment
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Zhejiang University. General Chemistry. Beijing: Higher Education Press, 2016. 2. Reference books [1] Tianjing University. inorganic chemistry. Beijing:Higher Education Press, 2006.

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2101003
Subtitle, if applicable	
Courses, if applicable	Engineering Thermodynamics
Semester(s) in which the module is taught	4th semester
Person responsible for the module	Associate Professor Liu Qingrong
Lecturer	Professor ZHU Qunzhi Lecturer Qiu Wei Lecturer Duan Rui Lecturer Zhang Tao
Language	Chinese
Relation to curriculum	Engineering thermodynamics is a subject that studies the law of mutual conversion between heat energy and other forms of energy (especially mechanical energy) and improves the economy of energy utilization. As one of the three major basic courses of energy, power, machinery, refrigeration and other engineering majors, it not only provides students with the necessary basic theoretical knowledge and basic skills to learn relevant professional courses, but also lays the necessary theoretical foundation for students to engage in the professional technical work and scientific research work in the field of heat energy utilization, heat design, heat management and heat control in the future.
Type of teaching, contact hours	Target students: sophomore majoring in energy and power engineering Type of teaching: theory teaching, computer teaching Contact hours: 64 hours Of which Theoretical teaching: 60 hours Experiment / practical teaching: 4 hours Size of class size: No more than 60 students in theory class
Workload	Workload= 180 hours Contact hours = 64 hours Self-study hours =116 hours
Credit points	6.0
Requirements according to the examination	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.

regulations	
Recommended prerequisites	Advanced mathematics, College Physics
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand thermodynamic process and basic theories through teaching and practice. Specific objectives include: ● Knowledge: Students should understand the basic concepts of thermodynamics (thermal power plant, thermal system, thermodynamic state, quasi-static process, reversible process, process work and heat, thermal cycle); understand the essence of the first law and the second law of thermodynamics. The concepts of energy conservation and energy dissipation are established. Master the law of effective utilization of thermal energy and mutual conversion of mechanical energy; understand the basic thermodynamic properties of pure matter and ideal gas mixture, understand the main thermodynamic properties of pure matter phase change process; master the basic analysis methods of thermal process and thermal cycle, as well as the basic methods and ways to improve the utilization rate of thermal energy. ● Skills: Students should be able to use the basic concepts of thermodynamics, select the thermodynamic system and list the simplified conditions according to the characteristics of practical problems, and be able to calculate the work and heat; be proficient in the application of the thermodynamic property charts and formulas of air, water vapor and other commonly used working fluids, and be able to calculate the relevant thermal process; master the basic analysis methods of thermal process and thermal cycle, and improve the thermal energy The basic methods and approaches of utilization rate. ● Competences: Students acquire practical abilities and innovative thinking on the basis of thermodynamics theories and engineering technology knowledge.
Content	1. Theoretical teaching (64contact hours; 116self-study hours) Chapter 1 basic concepts and definitions (4 contact hours; 8 self-study hours) • The process of mutual conversion of heat and mechanical energy

	• Thermal system • Thermodynamic state and basic state parameters of working medium • Equilibrium state, equation of state, coordinate diagram • The state change process of working medium • Process work and heat • Thermal cycle Chapter 2 the first law of thermodynamics (4 contact hours; 8 self-study hours) • The essence of the first law of thermodynamics • Thermodynamic energy and enthalpy • The basic energy equation of the first law of thermodynamics • Energy equation of open system • Application of energy equation Chapter 3 Properties of gas and steam (8 contact hours; 12 self-study hours) • The concept of ideal gas • Specific heat capacity of ideal gas • Thermodynamic energy, enthalpy and entropy of ideal gas • Saturated state and phase diagram of water vapor • Vaporization process and critical point of water • Diagram of state parameters and thermal properties of water and steam • Experiment: measurement of the relationship between saturated temperature and pressure of water vapor Chapter 4 Basic thermal process of gas and steam (8 contact hours; 16 self-study hours) • The reversible and changeable process of ideal gas • Constant volume process, constant pressure process and constant temperature process • Adiabatic process • Comprehensive analysis of ideal gas thermodynamic process • The basic process of water vapor Chapter 5 the second law of thermodynamics (8 contact hours; 16 self-study hours) • The second law of thermodynamics • Analysis of Carnot cycle and multi heat source reversible cycle • Carnot's theorem • The mathematical expression of entropy and the second law of thermodynamics • Entropy equation • Entropy principle of isolated system • Exergy

	• Principle of energy depreciation Chapter 6 properties of actual gas and general thermodynamic relations (2 contact hours; 4 self-study hours) • Deviation of ideal gas equation of state for real gas • Van der Waal equation and r-K equation • The principle of corresponding states and the general compressibility factor graph Chapter 7 Flow of gas and steam (8 contact hours; 16 self-study hours) • The basic equation of steady flow • Conditions to change the flow rate • Calculation of nozzle • Analysis of flow process in nozzle with back pressure change • Adiabatic flow with friction • Adiabatic throttling • Experiment: nozzle flow experiment test. Chapter 8 Thermal process of compressor(2 contact hours; 4 self-study hours) • Working principle and theoretical power consumption of single stage piston compressor • Influence of clearance volume • Multistage compression and interstage cooling Chapter 9 Gas power cycle (2 contact hours; 4 self-study hours) • General method of analyzing dynamic cycle • Gas turbine unit cycle • Measures to improve cycle thermal efficiency of gas turbine plant Chapter 10 cycle of steam power plant (6 contact hours; 12 self-study hours) • Simple steam power plant cycle Rankine cycle • Reheat cycle • Regenerative cycle • Cogeneration Cycle • Steam gas combined cycle Chapter 11 refrigeration cycle (4 contact hours; 8 self-study hours) • Overview of refrigeration cycle • Compressed air refrigeration cycle • Compressed steam refrigeration cycle • Properties of refrigerants • Heat pump cycle Chapter 12 Ideal gas mixture and wet air(4 contact hours; 8 self-study hours) • Ideal gas mixture

	• Specific heat capacity, thermodynamic energy, enthalpy and entropy of ideal gas mixture • Wet air • State parameters of wet air • Wet bulb temperature and adiabatic saturation temperature • Enthalpy humidity diagram of wet air • Wet air process and its application
Study and examination requirements and forms of examination	Final score includes: usual performance (10%); experiment (10%), final exam (80%). Usual performance includes: assignment and attendance and experiment
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Shen Weidao, Tong Jungeng. Engineering thermodynamics (Fifth Edition), Higher Education Press, 2016. 2. Reference books [1] Shen Weidao, Tong Jungeng. Engineering Thermodynamics (Fourth Edition). Higher Education Press, 2001. [2] Pang Luming. Engineering Thermodynamics (Third Edition). Hydropower Press. [3] Wang Yongqing, et al. Engineering Thermodynamics. China Electric Power Press, 2004 [4] MC. Potter et al. Engineering Thermodynamics. Science Press, 2002 [5] H.D. bell, Theoretical Basis and Engineering Application of Engineering Thermodynamics, Science Press, 1983 [6] Tong Jungeng, ed., Engineering Thermodynamics Learning Guidance and Problem Solving (2nd Edition), Higher Education Press, 2008 3. Experiment instruction books [1] Self-compiled teaching materials 4. Other materials [1] PPT courseware (self-compiled)

Module designation	
Module level, if applicable	
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Introduction to Computer Network
Semester(s) in which the moduleis taught	
Person responsible forthemodule	Lecturer ZHANG Kai
Lecturer	Lecturer SUN Chaochao
Language	Chinese
Relation to curriculum	This course involves the content and foundation of disciplines such as computer science and electronic communication. Teachers should be proficient in the basic professional knowledge of related disciplines, who mainly focus on key explanations of some basic concepts and two-way interaction with students. The teaching process needs to provide students with typical network design cases, so that students can not only have a perceptual understanding of computer networks, but also have a sense of knowing the phenomenon, the principle, the use of understandable reality, and the corresponding emotional literacy. This course requires students to master the theoretical knowledge of computer networks, as well as good independent work and teamwork skills. And the students are required to be able to recognize, explain and use different computer network facilities to independently complete specific experimental and practical tasks.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching Contact hours: 32 hours (including Experiment / practice teaching: 4 hours) of which Theoretical teaching: 64 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Requirements according to the	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required

examination regulations	teaching experiments are allowed to take the exam.
Recommended prerequisites	Introduction to Computer Science, Digital Electronic Technology, Data Structure, Operating System, Programming Language and Principles of Computer Composition
Module objectives/intended learning outcomes	Based on the network reference model, students need to understand the working principles of typical protocols and data encapsulation methods at various levels, proficiently use typical network equipment at various levels, and know basic network interconnection methods. ● Knowledge:Therefore, students can summarize the knowledge structure of computer networks, explain important computer network protocols and the basic principles of technology. ● Skills:summarize the functions of different network service model levels, identify the similarities and differences of similar computer network protocols. ● Competences: solve common network problems.
Content	1. Theoretical teaching (32 contact hours; 28 self-study hours) Chapter 1 OSI and TCP/IP reference models, network services and protocols (2 contact hours; 2 self-study hours) Chapter 2 Physical layer(4 contact hours; 4 self-study hours) Chapter 3 Data link layer(4 contact hours; 4 self-study hours) Chapter 4 Media Access Control Sublayer (4 contact hours; 4 self-study hours) Chapter 5 Network layer (8 contact hours-including 2 practice hours; 8 self-study hours) Chapter 6 Transport layer (4 contact hours; 4 self-study hours) Chapter 7 Application layer (4 contact hours-including 2 practice hours; 4 self-study hours) Chapter 8 Cyber Security (2 contact hours; 2 self-study hours)
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (closed book written examination) (70%).
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Computer Network (7th edition). XirenXie, Publishing

	House of Electronics Industry PHEI, 2017. 2. Reference books [1] Andrew S. Tanenbaum, Wei Yan, Aimin, Pan. Computer Network (5th edition). Beijing: Tsinghua University Press ,2012. [2] Computer Networking: A Top-Down Approach, 6th Edition. James Kurose. Keith W. Ross, China Machine Press ,2017.

Module designation	
Module level, if applicable	
Code, if applicable	11000740
Subtitle, if applicable	
Courses, if applicable	Combustion
Semester(s) in which the module is taught	5th semester
Person responsible for the module	Associate professor LI Fangqin
Lecturer	Professor QIU Zhongzhu Professor WU Jiang Professor PAN Weiguo Associate professor LI Yan Lecturer WANG Chengyao
Language	Chinese
Relation to curriculum	Combustion is one of the main courses for undergraduates of Energy and Power Engineering program. It is designed for four directions, i.e. Thermal & Power Engineering of Power plants, Clean Power Generation Technology, Energy Conservation and Energy Management. Main equipment used in Energy and Power Engineering such as boiler, gas turbine, internal-combustion engine and absorption chillers requires theoretical knowledge from the course of Combustion. Based on engineering practice, the course systematically delivers some basic combustion related theories regarding thermal chemistry, combustion dynamics and combustion process. It focuses on introduction of basic concepts of combustion process, combustion properties, formation mechanism of combustion products, combustion calculation, combustion chemical reaction dynamics fundamentals, combustion mechanism of gas, liquid and solid fuels, and combustion engineering technology and device. It lays a foundation for students to understand and analyze combustion process of thermal equipment, understanding of application of combustion knowledge in engineering, future engagement in design, operation and control of combustion equipment and system, and prevention of environmental pollution resulted from combustion emission.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching Contact hours: 32 hours

	Of which Theoretical teaching: 24 hours Experiment / practice teaching: 8 hours Size of class: No more than 70 students for theoretical teaching
Workload	Workload= 70 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Calculus; College Physics; College Chemistry; Engineering Thermodynamics; Engineering Fluid Mechanics; Heat Transfer.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand combustion process and basic theories through teaching and practice. Specific objectives involve in: ● Knowledge: Acquiring basic knowledge and theories on combustion technology such as thermal chemistry, combustion dynamics and combustion process, etc.; understanding the combustion properties of gas, liquid and solid fuel in Energy and Power Engineering, combustion characteristics and rules (including ignition conditions and forms, propagation of flame and formation mechanism of combustion , etc.); acquiring emission and prevention of combustion products; acquiring gas, liquid and solid fuel combustion technology, equipment and engineering application. By this course, students can acquire macro understanding and micro explanation of combustion phenomena such as boiler, internal-combustion engine, turbine and domestic furnace, etc. ● Skills: Students acquire basic theoretical and specialized knowledge about combustion engineering; understand engineering application of combustion; acquire deep insight into combustion phenomena and combustion mechanism; master methods for combustion equipment and combustion measurement; are able to analyze and resolve all kinds of engineering combustion problems including analyses and improvement of existing combustion methods. ● Competences: Students acquire practical abilities and

	innovative thinking based on combustion theories and engineering technology knowledge.
Content	1. Theoretical teaching (32 contact hours; 28 self-study hours) Chapter 1 air demand and combustion product generation (1 contact hours; 2 self-study hours) • calculation of air demand • amount, composition and density of combustion products Chapter 2 combustion temperature (1 contact hours; 2 self-study hours) • calculation of theoretical heating temperature of fuel • calculation of theoretical combustion temperature • factors affecting theoretical combustion temperature Chapter 3 jet mixing process (2 contact hours; 2 self-study hours) • free jet in stationary gas • free jet in parallel flow • cross jet • annular jet and concentric jet • rotating jet Chapter 4 combustion reaction speed and reaction mechanism (1 contact hours; 2 self-study hours) • chemical reaction speed • combustion reaction mechanism of combustible gas • Combustion reaction mechanism of carbon • formation mechanism of nitrogen oxide during combustion Chapter 5 ignition process (2 contact hours; 2 self-study hours) • ignition process and temperature • ignition process • ignition concentration limits • ignition and flameout in combustion chamber Chapter 6 combustion propagation process (2 contact hours; 2 self-study hours) • the concept of combustion front and its propagation mechanism • normal propagation speed of combustion front • propagation of turbulent combustion front Chapter 7 heterogeneous combustion (1 contact hours; 2 self-study hours) • heterogeneous reaction rate of carbon • combustion of carbon particles • combustion of oil particles Chapter 8 structure and stability of flame (1 contact hours; 2 self-study hours)

	• premixed combustion • diffusion combustion Chapter 9 combustion of gaseous fuels (2 contact hours; 2 self-study hours) • general • flaming • flameless combustion • flame stability, flame monitoring and flame protection technology Chapter 10 combustion of liquid fuel (2 contact hours; 2 self-study hours) • combustion process of liquid oil • atomization of oil • fuel burners • oil water emulsion combustion technology Chapter 11 combustion of solid fuel (2 contact hours; 2 self-study hours) • stratified combustion of solid fuels • pulverized coal combustion method • cyclone combustion method • boiling combustion method 2. Classroom practice (8 contact hours; 2 self-study hours) • Calculation of air demand in combustion • Calculation of combustion temperature • Design of burners 3. Experiment teaching (6 experimental operation hours; 4 self-study hours) • Experiment content: flame propagation • Requirements: grasp experiment principles; deepen • understanding of theoretical knowledge; learn to how use • common thermotechnical test instrument
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); experiment (10%), final exam (closed book written examination) (70%). Usual performance includes: assignment and attendance and computer practice Experiment score includes: experiment process; experiment report (50%); experiment exam (50%)
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] WANG Jun, MA Qiliang, ZHANG Zhendong. Engineering Combustion. Beijing: China Electric Power Press, 2008 2. Reference books [1] HUO Ran. Introduction to Engineering Combustion.

	Hefei: University of Science and Technology Press, 2001 [2] TONG Zhengming et al. Engineering Combustion. Beijing: China Measuring Press, 2008 [3] XU Tongmo. Combustion. Beijing: Machinery Industry Press, 2013 [4] K. Kuo. Principles of Combustion, Wiley 2005 3. Experiment/computer practice instruction books [1] Self-compiled teaching materials 4. Other materials [1]. PPT courseware (self-compiled)

Module designation	Professional Core Courses
Module level, if applicable	
Code, if applicable	2101009
Subtitle, if applicable	
Courses, if applicable	Principles of Steam Turbines
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Professor Hu Danmei
Lecturer	Associate processor He Ping Professor Zeng Zhuoxiong Professor Guo Ruitang Lecturer Ying Yulong Lecturer Ding Jiafeng
Language	Chinese
Relation to curriculum	“Principles of steam turbines” is one of the core professional courses for undergraduates of Energy and Power Engineering program, which plays an important role in connecting courses between the preceding and the followings. The steam power cycle part of the preceding course "Engineering Thermodynamics" tells the thermodynamic process and its law of transforming thermal energy into mechanical energy in thermal power plants, which lays a foundation for the study of this course. The follow-up course "Thermal Power Plants" is based on the understanding of the working process and rules of steam turbine regenerative cycle. It describes the feed water regenerative heating system and the economic analysis of thermal power plants from the perspective of thermal system. At the same time, from the point of view of the production process of thermal power plant, the feed water and steam system of power plant closely links the two courses of Principles of Boilers and Principles of Steam Turbines. From the point of view of "system", the teaching of "Principles of Steam Turbines” takes the steam power cycle process as the main line. It will straighten out the internal relationship between the relevant knowledge and thermal equipment in the system. It will enable students to understand and integrate, and establishes the overall concept of the knowledge they have learned.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, Experiment teaching

	Contact hours: 64 hours Of which Theoretical teaching: 60 hours Experiment teaching: 4 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 180 hours Contact hours = 64 hours Self-study hours = 116 hours
Credit points	6.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Advanced Mathematics, Physics, Engineering Thermodynamics, Engineering Fluid Mechanics, Heat Transfer, Metallic Material.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand basic structure of steam turbines, working principles and characteristics of off-design and major equipment, etc. By learning the course, students can lay a good foundation for future works, such as installation, commissioning, operation, maintenance of steam turbines. Specific objectives include: ● Knowledge: Master the working principle, working characteristics and basic thermodynamic calculation method of steam turbines; Master the overall structure, thermal process and characteristics of steam turbines, and lay a solid foundation for the thermal design of steam turbines ; Master the structural characteristics and mechanical strength, strength and vibration analysis of the main parts of steam turbines; Master the system structure and working principle of the governing and protection systems of steam turbines. Master general knowledge of steam turbine operation and issues concerning safe operation. ● Skills: Master working principle and characteristics of overall system of steam turbine; acquire basic principles and methods for operation and testing of steam turbine. understand engineering application of steam turbines; Acquire deep understanding of thermal process and characteristics of steam turbines; acquire the characteristics of variable operating conditions of steam turbines, so that the operation of the steam turbine can be independently analyses. ● Competences: Be able to engage in simple work such as

	steam turbine design and operation/administration work. Students acquire innovative thinking on the engineering technology knowledge of steam turbines.
Content	1. Theoretical teaching (58 contact hours; 106 self-study hours) Chapter 1 Operating principle of steam turbine stage (14 contact hours; 26 self-study hours) • Introduction • Work process in a steam turbine stage • Wheel efficiency and optimum velocity ratio of a steam turbine • Determination of major geometric dimensions of flow passage • Internal loss and internal efficiency of steam turbine stage • Thermal calculation of steam turbine stage • Long vane stage Chapter 2 Multi-stage steam turbine (6 contact hours; 11 self-study hours) • Working process of multi-stage steam turbine • Economy indicators of steam turbine unit • Axial thrust and balance of multi-stage steam turbine • Shaft seal system of multi-stage steam turbine Chapter 3 Off-design of steam turbine (12 contact hours; 22 self-study hours) • Off-design of nozzle • Flow parameter relation of stage group • Enthalpy drop and reaction degree change of Off-design steam turbine stage • Steam turbine Control methods and off-design of governing stage • Axial thrust change of Off-design steam turbine stage Chapter 4 Steam turbine Governing System (10 contact hours; 18 self-study hours) • Task and composition of a steam turbine governing system; • Static and dynamic characteristics of steam turbine governing system • governing system of reheat steam turbine • Task and composition of a steam turbine protection system; • Oil supply system of steam turbine • Digital electro-hydraulic (DEH) system of steam turbine Chapter 5 Steam Turbine for Cogeneration (4 contact hours; 7 self-study hours) • Task and composition of a Cogeneration steam turbine Chapter 6 Strength and vibration of steam turbine parts (6

	contact hours; 11 self-study hours) • Static parts of steam turbine • Rotating parts of steam turbine • Vibration of steam turbine blades • Vibration of steam turbine rotor Chapter 7 Condensing equipment of steam turbine (4 contact hours; 7 self-study hours) • Task and composition of a condensing equipment of steam turbine Chapter 8 Steam turbine Operation (2 contact hours; 4 self-study hours) • Thermal stress and thermal deformation of steam turbine parts • Start-up of steam turbine • Shut-down of steam turbine • Maintenance of steam turbine system 2. Classroom practice (2 contact hours; 4 self-study hours) • Thermal calculation of steam turbine stage 3. Experiment / practice teaching (4 experiment hours; 6 self-study hours) • Vibration of steam turbine blades • Eddy current inspection of a condensing equipment of steam turbine
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); final exam (closed book written examination) (80%). Usual performance includes: assignment (5%) and attendance (5%) and experiment (10%). Experiment score includes: experiment process; experiment report (5%); experiment exam (5%)
Media employed	Microphone , multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Jin Zhiping. Principle and System of Steam Turbine in Power Plant, Beijing: China Electric Power Press, ISBN：978-7-5083-4271-9, 2004 2. Reference books [1] Jian Tiancong. Principles of Steam Turbines. Beijing: China WaterPower Press, ISBN：9787801254405，1992 [2] Huang Shuhong. Principles of Steam Turbines. Beijing: China Electric Power Press, ISBN：9787508372693，2008 3. Exercise book [1] Self-compiled teaching materials 4. Other materials [1] PPT courseware (self-compiled)

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2132023
Subtitle, if applicable	
Courses, if applicable	Engineering Fluid Mechanics, Pumps and Fans
Semester(s) in which the module is taught	4th and 5th semester
Person responsible for the module	Professor Li Qifen
Lecturer	processor Liu Fang Associate professor Weng Jianghua Associate professor Jiang Weiting Associate professor Fu Zaiguo
Language	Chinese
Relation to curriculum	This course mainly studies the static state and motion state of the fluid itself under the action of various forces, the interaction and flow law between the fluid and the solid boundary wall in relative motion, and the basic working principles, performance and operation of pumps and fans Knowledge of regulation, etc. As one of the three major basic courses of energy, power, machinery, refrigeration and other engineering majors, it not only provides students with the necessary basic theoretical knowledge and basic skills to learn relevant professional courses, but also lays the necessary theoretical foundation for students to engage in the professional technical work and scientific research work in the Pipe network design, pump and fan design, and fluid control in the future.
Type of teaching, contact hours	Target students: sophomore majoring in energy and power engineering Type of teaching: theory teaching, computer teaching Contact hours: 96 hours Of which Theoretical teaching: 90 hours Experiment / practical teaching: 6 hours Size of class size: No more than 90 students in theory class
Workload	Workload= 270 hours Contact hours = 96 hours Self-study hours =174 hours
Credit points	6.0

Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Advanced mathematics, College Physics
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand fluid mechanics process and basic theories through teaching and practice. Specific objectives include: ● Knowledge: Students should understand the main physical properties of fluids, hydrostatics, basic concepts and basic equations of fluid dynamics, dimensional analysis and similar principles, basic theories of ideal fluid motion and viscous fluid motion, one-dimensional and two-dimensional gas flow, and The basic concepts and theories of pumps and fans. ● Skills: Students should master the necessary fluid mechanics analysis and calculation methods. Possess certain experimental skills in fluid mechanics. Acquire the ability to analyze and solve practical engineering problems in fluid mechanics. At the same time, the ability to analyze and solve practical problems of pumps and fans is also required. ● Competences: Students acquire practical abilities and innovative thinking on the basis of fluid mechanics theories and engineering technology knowledge.
Content	Theoretical teaching (96 contact hours; 174 self-study hours) Part One Fluid Mechanics Chapter 1 Introduction (2 contact hours; 2 self-study hours) • Research content of fluid mechanics • Research methods of fluid mechanics • The position of fluid mechanics in engineering technology and teaching plans Chapter 2 Fluid and its physical properties (6 contact hours; 10 self-study hours) • Definition and characteristics of fluid • Assumption of fluid continuous medium • The force acting on the fluid • Fluid characteristics and main physical parameters • The surface properties of the liquid Chapter 3 Hydrostatics (8 contact hours; 14 self-study hours) • The static pressure and characteristics of the fluid • Differential equation of fluid balance • Basic equations of hydrostatics

	• Absolute pressure, gauge pressure, liquid column pressure gauge • Relative balance of liquid • The total pressure of the static liquid acting on the plane and the curved surface • The buoyancy of a static liquid acting on an object Chapter 4 Fluid Kinematics and Fluid Dynamics Fundamentals (10 contact hours; 20 self-study hours) • Methods of studying fluid flow • Classification of flows • Trace and streamline • Flow tube, flow beam, flow • System and control body • Continuity equation, momentum equation and moment of momentum equation, energy equation • Bernoulli equation and its application • Changes in pressure and velocity along the main normal of the streamline • Bernoulli equation of the total flow of viscous fluid Chapter 5 Similarity Principle and Dimensional Analysis (4 contact hours; 8 self-study hours) • The mechanics of flow is similar • Power similarity criterion • Similar flow conditions • Approximate model test • Dimensional analysis method Chapter 6 Flow and Hydraulic Calculation in Pipe (10 contact hours; 20 self-study hours) • Loss of energy flowing in the tube • Two flow states of viscous fluid, laminar flow and turbulent flow • Flow in the inlet section of the pipeline • Loss along the way and local losses • Pipeline hydraulic calculation • Outflow of liquid • Water hammer, cavitation and cavitation Chapter 7 One-dimensional Flow of Gas (8 contact hours; 14 self-study hours) • One-dimensional propagation, speed of sound, and Mach number of weak disturbances • The specific state of the airflow and the reference speed and speed coefficient • Normal shock wave • Variable cross-section pipe flow

	• Constant cross-section friction tube flow and heat exchange tube flow Chapter 8 Swirling and Non-Swirling Flow of Ideal Fluid (8 contact hours; 14 self-study hours) • Continuous equation in differential form, swirling flow and non-rotating flow • Differential equation of motion of ideal fluid, Bernoulli equation, definite solution conditions • Introduction of vortex wire, vortex tube, vortex beam, vortex flux • Velocity circulation, Stokes' theorem, etc. • Potential flow, velocity potential and flow function • Superposition of plane flow and plane non-rotating flow of several simple incompressible fluids • Parallel flow bypasses the cylindrical plane without circulation and flows with circulation • Kuta-Jukovsky formula and Kuta conditions of the cascade Chapter 9 The Flow of Viscous Fluids Around Objects (6 contact hours; 10 self-study hours) • The differential equation of motion of incompressible viscous fluid • Laminar flow of incompressible viscous fluid • Boundary layer, laminar boundary layer and its differential and integral equations • Displacement thickness and momentum loss thickness of the boundary layer • Approximate calculation of the laminar boundary layer, turbulent boundary layer, and mixed boundary layer of the flat plate • Separation phenomenon of curved boundary layer • Flow around the cylinder, the Karman vortex street; the resistance and drag coefficient of the object, and the control of the boundary layer • The steady parallel flow that bypasses the stationary sphere at small Reynolds number • Freely submerged jet Chapter 10 Two-dimensional flow of gas (2 contact hours; 4 self-study hours) • The propagation and Mach cone of weak disturbance in space • Weak disturbance wave • Oblique shock wave

	Part Two Pumps and Fans • Chapter 1 Introduction (2 contact hours; 4 self-study hours) • The role and classification of pumps and fans • The main components and functions of pumps and fans • The main performance parameters of pumps and fans • The development trend of pumps and fans Chapter 2 Impeller Theory of Pumps and Fans (6 contact hours; 12 self-study hours) • The working principle of centrifugal pumps and fans • The movement and velocity triangle of the fluid in the impeller • Energy equation and its analysis • Centrifugal impeller blade type and its analysis • Impeller theory of axial flow pump and fan Chapter 3 Performance of Pumps and Fans (4 contact hours; 7 self-study hours) • Power, loss and efficiency • Performance curve and analysis of pump and fan Chapter 4 Application of Similarity Theory in Pumps and Pumps (4 contact hours; 7 self-study hours) • Law of similarity • Specific speed • Dimensionless performance curve • General performance curve Chapter 5 Pump Cavitation (4 contact hours; 7 self-study hours) • Cavitation phenomenon and its harmfulness • Suction vacuum height, cavitation margin • Cavitation similarity law, cavitation specific speed • Measures to improve pump anti-cavitation performance Chapter 6 Operation of Pumps and Fans (4 contact hours; 7 self-study hours) • Pipeline characteristic curve and operating point • Joint work • Adjustment of operating conditions • Cutting and lengthening of blades • Main problems in operation Chapter 7 Pumps and fans commonly used in thermal power plants (4 contact hours; 7 self-study hours) • The structure and performance of commonly used pumps in thermal power plants • The structure and performance of fans commonly used in thermal power plants

	• Chapter 8 Selection of Pumps and Fans (4 contact hours; 7 self-study hours) • Selection principle • Selection method • Process and application of humid air
Study and examination requirements and forms of examination	Final score includes: usual performance (10%); experiment (10%), final exam (80%). Usual performance includes: assignment and attendance and experiment
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Kong Long. Engineering Fluid Mechanics (4th Edition), China Electric Power Press, 2014. [2] Guo Lijun, He Chuan. Pump and Fan(5th Edition), China Electric Power Press, 2014. 2. Reference books [1] Zhang Zhaoshun, et al. Fluid Mechanics. Tsinghua University Press, 1999. [2] Zhao Xunduan, et al. Viscous Fluid Mechanics. China Machine Press, 1993. [3] Kong Long et al. Compressible Fluid Mechanics. China WaterPower Press, 1991. [4] Wang Songling, et al. Fluid Mechanics. China Electric Power Press, 2004. [5] Chen Wenyi, et al. Fluid Mechanics. Tianjin University Press，2004. [6] Wang Handong et al. Pump and Fan. China Machine Press，2003. [7] Zhang Liangyu et al. Pump and Fan. China Electric Power Press，2005. [8] Sha Yi et al. Pump and Fan. University of Science and Technology of China Press，2005. 3. Experiment instruction books [1] Self-compiled teaching materials 4. Other materials [1]. PPT courseware (self-compiled)

Module designation	Subject Foundation
Module level, if applicable	
Code, if applicable	2101004
Subtitle, if applicable	
Courses, if applicable	Heat Transfer
Semester(s) in which the module is taught	5th semester
Person responsible for the module	Professor ZHANG Li
Lecturer	Professor ZHANG Li Professor REN Hongbo Associate professor JIANG Weiting Lecturer QIU Wei Lecturer WANG Wenhuan
Language	Chinese
Relation to curriculum	Heat Transfer is one of the main professional basic courses for undergraduats of Energy and Power Engineering program. The course focuses on the basic law of heat transfer. It mainly includes the basic concept, theory, calculation and application of heat conduction, convection, radiation and heat transfer process. The course is highly theoretical and practical. It can cultivate students' ability to analyze and solve heat transfer problems. It provides basic theoretical knowledge of heat transfer for the following courses, such as Combustion, Boiler principle, Turbine principle, Thermal power plant, Refrigeration principle and equipment, Energy saving technology, Thermal engineering testing technology, etc. It also lays a foundation for students to participate in scientific and technological innovation projects, professional practice, bachelor's thesis and other learning links.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer practice, experiment Contact hours: 64 hours Of which Theoretical teaching: 56 hours computer practice: 2 hours Experiment: 6 hours Size of class: No more than 70 people for theoretical teaching
Workload	Workload= 180 hours

	Contact hours = 64 hours Self-study hours = 116 hours
Credit points	6.0
Requirements according to the examination regulations	Only students with class/online attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Advanced mathematics; Linear algebra; College Physics; Engineering Thermodynamics; Engineering Fluid Mechanics.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand the basic, basic theory calculated method of three basic ways of heat transfer, heat transfer process through teaching and practice. Specific objectives include: ● Knowledge: 1. Basic knowledge, including basic concepts, theories and calculation methods of conduction, convection, radiation and heat transfer processes. It helps students solve basic heat transfer problems in engineering; 2. Theoretical knowledge, including boundary layer theory, similarity principle and numerical solution method. It helps students ponder and analyze of heat transfer problem, and train students' thinking ability; 3. Knowledge application, including design and checking calculation of heat exchanger. It helps students useheat transfer knowledge in engineering practice. ● Skills: 1. Experimental skill, master the basic skills of experimental measurement of temperature, velocity, heat, flow rate, etc; familiar with experimental operation and data processing skills; 2. Numerical calculation skill, master the skills of numerical solving the temperature distribution of conduction rproblem. ● Competences: Improve students ability in solving practical physical problems with basic Heat Transfer theoretical knowledge; develop students' ability to think and practice; cultivate students to have the ability to further study for future work.
Content	1. Theoretical teaching (56 contact hours; 104 self-study hours) Chapter 1 Introduction (4 contact hours; 7 self-study hours) • Three basic ways of heat transfer: conduction, convection and radiation;* • Heat resistance; the analysis method of heat resistance; heat transfer process; heat transfer coefficient; • development history of Heat Transfer.

	Chapter 2 Basic Rules of Heat Conduction and Steady Heat Conduction (8 contact hours; 16 self-study hours) • Temperature field; temperature gradient; Heat flux vector; Fourier's law;** • Differential equation of heat conduction; the condition of definite solution of heat conduction problem: initial and boundary conditions; * • Thermal conductivity of flat walls, cylinder walls and ball walls; fin heat conduction;** • Variable cross-section, variable thermal conductivity, heat source and multi dimension heat conduction. Chapter 3 Unsteady Heat Conduction (6 contact hours; 11 self-study hours) • Basic concepts of unsteady heat conduction; lumped parameter method;** • nalysis of one-dimensional unsteady heat conduction solution; Nomograph;* • Solving of multi-dimensional unsteady heat conduction problems; • Unsteady heat conduction of a semi-infinite body. Chapter 4 Numerical Solution of Heat Conduction Problem (4 contact hours; 7 self-study hours) • Basic ideas of numerical solution of heat conduction problems; • The establishment method of discrete equations; the Iterative method for solving algebraic equations; • Numerical solution of unsteady heat conduction problems. Chapter 5 Theoretical basis of convective heat transfer (4 contact hours; 8 self-study hours) • Introduction of heat convection, Newton's formula; affecting factors of heat convection coefficient, concepts of temperature boundary layer;* • Differential equation of convective heat transfer process; differential equations of convective heat transfer; differential equations of convective heat transfer in boundary layer;* • Theoretical analysis solution of laminar flow along plate; analogy theory of momentum transfer and heat transfer, Similarity theory; dimensional analysis method.* Chapter 6 Experimental correlation of single-phase convective heat transfer (8 contact hours; 15 self-study hours) • Experimental correlation of internal forced convection heat transfer;** • Experimental correlation of external forced convection heat transfer;** • Experimental correlation of natural convection heat transfer in large space and limited space**

	Chapter 7 Boiling and Condensation Heat Transfer (4 contact hours; 6 self-study hours) • Dropwise condensation; film condensation; Laminar film condensation heat transfer analysis and experimental correlation; affecting factors of film condensation • Large container saturated boiling curve, Experimental correlation of boiling heat transfer in large container; factors affecting boiling heat transfer. • Chapter 8 Basic Law of Radiation and Object Radiation Characteristics (4 contact hours; 7 self-study hours) • Characteristics of thermal radiation; three characteristics of input radiation; black body** • Radiation force; monochromatic radiation force, directional radiation intensity; the basic law of black body thermal radiation: Planck's constant law, Wien's law, Stephen, Boltzmann's law, lambert's law;* • Radiation characteristics of solid and liquid; blackness;* • Absorption ratio of the solid and liquid; Kirchhoff's law; grey body;* Chapter 9 Calculation of Radiation Heat Transfer (6 contact hours; 12 self-study) • Definition of angular coefficient; properties of angular coefficient; calculation of angular coefficient;** • Radiation heat transfer between two solid surfaces separated by heating medium; • Heat radiation network diagram method of radiation heat exchange; calculation of radiation heat transfer surface system; the principle of heat shield plate.* Chapter 10 Analysis of Heat Transfer Process and Calculation of Heat Exchanger (8 contact hours; 15 self-study hours) • Heat transfer coefficient; analysis and calculation of heat transfer process; critical insulation diameter;** • Logarithmic average temperature difference formula;** • Design and check calculation method of heat exchanger: Average temperature difference method,ε-NTU method; • Heat transfer process control* 2. Computer practice (2 contact hours; 6 self-study hours) Numerical solution of heat conduction problems; Solving one-dimensional steady heat conduction problem by programming on computer; Solving two-dimensional steady heat conduction problem by programming on computer; 3. Experiment teaching (6 experimental operation hours; 6 self-study hours) (1) Measurement of thermal conductivity of granular materials Heat conduction experiment: master affecting

	factors of conduction process; familiar with measurement method of temperature; (2) Heat transfer experiment of gas flowing through a single tube in transverse direction: understand the experimental method of measuring convective heat transfer coefficient; familiar with measurement method of quantity of heat, velocity and temperature; (3) Measurement of object blackness Radiation heat transfer experiment: master affecting factors of radiation heat transfer process; familiar with testing method of temperature. (4) Heat exchanger experiment: understand the experimental method of measuring heat transfer coefficient of Heat exchanger; familiar with testing method of temperature, rate of flow.
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); final exam (closed book written examination) (80%). Usual performance includes: assignment and class/online attendance and midterm exam score and experiment score
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks，teaching test bed
Reading list	1. Required books [1] TAO wenquan. *Heat Transfer*(5^{th}). Beijing: Higher Education Press, 2019. 2. Reference books [1] YANG Shiming, TAO Wenquan. *Heat Transfer*(4^{th}). Beijing: Higher Education Press, 2006. [2] J.P.Holman. *Heat Transfer*. Beijing: Machinery Industry Press, 2011 [3] ZHANG Yi. *Heat Transfer*.Nanjing: Southeast university Press, 2004. [4] ZHANG Tiansun. *Heat Transfer*. Beijing: China electric power Press, 2006. 3. Experiment/computer practice instruction books [1] Self-compiled teaching materials 4. Other materials [1] PPT courseware (self-compiled) [2] Teaching cases (self-compiled)

Module designation	Professional Core Course
Module level, if applicable	Compulsory
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Boiler principle
Semester(s) in which the moduleis taught	6th semester
Person responsible forthemodule	Professor WU Jiang
Lecturer	Associate professor Fangqin Li Professor QIU Zhongzhu Associate professor LI Yan Associate professor DING Honglei Associate professor CHENG Zhihai Lecturer GUAN Zhenzhen
Language	Chinese
Relation to curriculum	Boiler theory is one of the major professional courses for undergraduates majoring in energy and power engineering. Through the study of this course, students will master the basic principles of boiler work and the working processes in the furnace and the boiler; master the structure and working characteristics of modern large and medium-sized coal-fired boiler equipment; master the causes and common causes of common faults in the operation of boiler equipment and Solution. Train students with high ability to analyze, judge and solve problems; at the same time, train students with basic skills for practical operation and lay a good foundation for future work in boiler operation, regulation, improved design and experimental research.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, experiment Contact hours: 64 hours Of which Theoretical teaching: 56 hours Experiment: 4 hours Size of class: No more than 70 people for theoretical teaching
Workload	Workload= 180 hours Contact hours = 64 hours Self-study hours = 116 hours
Credit points	6.0

Requirements according to the examination regulations	Only students with class/online attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Calculus, College chemistry, Engineering Thermodynamics, Engineering Fluid Mechanics, Heat Transfer and Engineering Combustion
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand combustion process and basic theories through teaching and practice. Specific objectives include: ● Knowledge: Master the basic knowledge and theory of power plant boiler operation, such as fuel combustion calculation, boiler unit heat balance calculation and heat exchange calculation; understand the operation process and principle of pulverized coal preparation, combustion, steam-water conversion, slag and dust removal, and ash removal; master Power plant boiler steam quality and pollution prevention technology; understand the operation and regulation of power plant boilers and the dynamic characteristics of boiler operation. By studying this course, students can have a macro understanding and micro explanation of the overall operation system and individual components of the power station. ● Skills: By studying this course, students should master the structure and basic working principles of boilers, have general knowledge of boiler safety and economic operation, understand the latest technology development status and research directions of domestic and foreign boilers, and have analysis of engineering problems, engineering design calculations, and fieldwork. The preliminary ability of the test lays a good foundation for future work in boiler operation, commissioning, improved design and test research. ● Competences: Students acquire practical ability and innovative thinking, as well as the engineering and technical knowledge required in the work, based on the theory and practice of power plant boiler operation.
Content	1. Theoretical teaching (56 contact hours; 104 self-study hours) Overview（contact hours 4，self-study hours 8） • Working Process of Boiler Unit • Boiler Unit System and Components • Boiler Capacity, Parameters and Classification • Main Forms of Subcritical Parameter Boilers

	• Main Forms of Supercritical Parameter Boilers Chapter 2 Fuels and Their Combustion Characteristics（contact hours 2，self-study hours 4） • Fuel for Power Station Boilers • Elemental and Industrial Analysis of Coal • Calculation Basis of Coal Composition • Calorific value of coal and related concepts • Judgment of slagging and ash accumulation characteristics of coal ash • Classification of Coal • Combustion Characteristics of Coal • Characteristics of Fuel and Gas Chapter 3 Calculation of Fuel Combustion and Thermal Balance of Boiler Units（4 contact hours，8 self-study hours） • Chemical Reactions in the Combustion Process • Amount of Air Required for Combustion • Amount of Air Combustion • Flue gas analysis • Burning Equation • Determination of excess air coefficient during operation • Enthalpy of Air and Smoke • Thermal Balance of Boiler Units • Thermal Balance Experiment of Boiler Unit Chapter 4 Preparation and System of Pulverized Coal（contact hours 6，self-study hours 12） • General Characteristics of Pulverized Coal • Pulverized Coal Fineness and Pulverized Coal Particle Distribution Characteristics • Grindability coefficient and wear index of coal • Coal Mill • Milling System • Coal Feeder and Powder Feeder • Pulverized Coal Separator Chapter 5 Basics of Combustion Theory（contact hours 2，self-study hours 4） • Chemical Reaction Speed • Major Factors Affecting the Speed of Chemical Reactions • Fire on Fire • Chain Reaction • Flame Propagation • Combustion of Pulverized Coal • Power, Diffusion and Transition Zones for Carbon Particulate Combustion • Primary and Secondary Reaction Mechanisms of Carbon Particles Chapter 6 Combustion Equipment and New Technology for

	Pulverized Coal Combustion（contact hours 6，self-study hours 12） • Overview • DC Pulverized Coal Burner • Swirl Pulverized Coal Burner • Pulverized Coal Furnace Furnace • Combustion of Pulverized Coal Gas • Low-load Stable Combustion and Low NOx Pulverized Coal Combustion Technology • Supercritical Parameter Boiler Burner and Air Distribution Technology • W-shaped Flame Combustion Technology • Oil Burners and Igniters • Plasma Ignition Principle and Pulverized Coal Ignition Burner Chapter 7 Superheater and Reheater（contact hours 4，self-study hours 8） • Functions and operating characteristics of superheaters and reheaters • Structure of Superheater and Reheater • Typical Superheater and Reheater Systems and Material Selection • Thermal Deviation • Static Characteristics of Temperature Changes • Factors Affecting Temperature Changes • Adjustment of Superheated Steam Temperature and Reheated Steam Temperature Chapter 8 Economizer and Air Preheater（contact hours 4，self-study hours 8） • Function and Structure of Economizer • Main parameters of economizer and starting protection • Form of Air Preheater • Air Leakage and Thermal Deformation of Rotary Air Preheater • Abrasion, Fouling and Corrosion of the Heated Surface of the Tail Chapter 9 Boiler Furnace Heat Exchange Calculation（contact hours 4，self-study hours 8） • Characteristics of Heat Transfer in Boiler Furnace • Basic Equations of Radiative Heat Transfer in Furnace and Calculation Method of Effective Radiant Heat • Similar theoretical calculation method for heat transfer in furnace • Radiation Characteristics of Heating Surface of Furnace • Black Poison in the Furnace • Correction factor M of flame center position • urnace Structural Features and Other Parameters

	• Correction method of furnace heat transfer calculation • Other Calculation Methods for Furnace Heat Exchange • Calculation of Heat Transfer of Convection • Heating Surface Chapter 10 Calculation of Heat Transfer of Convection Heating Surface（contact hours 4，self-study hours 8） • Overview • Basic Equations for Heat Transfer Calculation of Convection Heating Surface • Calculation method of heat transfer coefficient of heating surface • Influence of Convection Heating Surface Pollution on Heat Exchange • Calculation of Heat Transfer Temperature and Pressure • Calculation of Convection Heat Transfer Area and Velocity • Computational Characteristics of Main Convection Heating Surfaces • Procedures and Methods of Boiler Thermal Calculation Chapter 11 Heating Surface Layout and Optimal Design of Power Plant Boilers（contact hours 2，self-study hours 4） • Factors Affecting Boiler Furnace Structure and Heating Surface Arrangement • Optimal Design of the Main Parameters of the Boiler Chapter 12 Natural circulation evaporation system and safe operation（contact hours 4，self-study hours 8） • Natural Cycle Principles and Basic Concepts • Safe Operation of Water-Cooled Walls of Natural Circulation Boilers • Vapor-liquid two-phase flow pattern and heat transfer in the evaporation tube • Flow parameters of vapor-liquid two-phase fluid • Flow resistance and pressure drop of vapor-liquid two-phase fluid • Water cycle calculation and water cycle characteristic curve for simple circuit • Calculation of Water Cycle in Complex Circuits • Water cycle full characteristic curve and cycle safety inspection • Calculation of Deterioration Conditions of Heat Transfer in Evaporation Tubes • Measures to Improve Cyclic Safety • High Temperature Corrosion of Water-Cooled Walls Chapter 13 Supercritical Once-through Boilers and Subcritical Parameters Forced Flow Boilers（contact hours 4，self-study hours 8） • Main Features of Once-through Boilers and Forms of

	Water-Cooled Walls • Hydrodynamic Characteristics of Once-through Boilers • Pulsating Flow of Evaporation Tubes at Subcritical Parameters • Thermal Deviation of Once-through Boilers • Heat transfer in water-walled tubes under supercritical parameters • Mid-point temperature control and steam temperature adjustment of supercritical parameter boilers • Low parameter rate and compound cycle boiler • Controlled circulation boiler • tart-up System of Once-through Boiler Chapter 14 Steam Quality of Power Plant Boilers and Pollution Prevention（contact hours 2，self-study hours 4） • Steam Quality of Utility Boilers • Causes of Steam Pollution and Their Treatment • Water Purification • Steam Essence in the Pot • Water Vapor Quality of Supercritical Units Chapter 15 Operation and Regulation of Power Station Boilers（contact hours 2，self-study hours 4） • Start-up of Power Station Boiler • Outage of boiler • Variable Load Operation Mode of Boiler • Boiler Combustion Adjustment and Steam Pressure Adjustment • Feedwater Regulation of Boiler Boilers • Boiler Steam Temperature Adjustment • Features of Operation Adjustment of Once-through Boiler Chapter 16 Boiler Dynamics（contact hours 2，self-study hours 4） • The boiler heat storage capacity • Dynamic Characteristics of a Boiler • Dynamic Characteristics of Once-through Boilers Chapter 17 Circulating Fluidized Bed Combustion Boiler（contact hours 2，self-study hours 4） • Description and Properties of Fluidization • Working Principle of Circulating Fluidized Bed Coal-fired Boiler Furnace • Main Features of Circulating Fluidized Bed Coal-fired Boiler • Composition of CFB Coal-fired Boiler 2. Experiment teaching (4 experimental operation hours; 12 self-study hours)
Study and examination	Final score includes: usual performance (20%); experiment (10%), final exam (closed book written examination) (70%).

requirements and forms ofexamination	Usual performance includes: assignment and attendance and computer practice Experiment score includes: experiment process; experiment report (50%); experiment exam (50%)
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Quangui Fan and others. Boiler principle (2nd Edition). Beijing: China Electric Power Press, 2014.2 2. Reference books [1] QuanguiFan, editor-in-chief . Ultra-supercritical and supercritical parameter boilers. Beijing: China Electric Power Press, 2000.9 [2] Edited by Feng Junkai. Boiler Principle and Calculation (Third Edition). Beijing: Science Press, 1992 [3] Edited by Yan Weiping. Clean coal power generation technology. Beijing: China Electric Power Press, 2003.7

Module designation	
Module level, if applicable	
Code, if applicable	2101091
Subtitle, if applicable	
Courses, if applicable	Thermal Power Plants
Semester(s) in which the module is taught	7th semester
Person responsible for the module	Associate professor ZHENG Puyan
Lecturer	Associate professor WANG Du Lecturer LU Jianfeng Lecturer YAN Ting Lecturer LIU Xiaojing Associate processor MA Xinxia
Language	Chinese
Relation to curriculum	The course of thermal power plants is the last professional course of this major, taking "plant" as the research object. Through the study of this course, students can master the comprehensive analysis method of power enterprise energy balance and thermal system by applying the knowledge of professional courses and related professional basic courses. This course is based on other basic courses and professional courses, and is closely related to the actual power plant production. It is necessary to combine theory with practice in the teaching process, and enables students to pay attention to the method of applying theory to practice. And then students can apply it comprehensively in the subsequent course design of thermal power plants.
Type of teaching, contact hours	Targeted students: senior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 48 hours Of which Theoretical teaching: 48 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 135 hours Contact hours = 48 hours Self-study hours = 87 hours
Credit points	3.0
Requirements	Only students with class attendance rate over 2/3 and

according to the examination regulations	assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Engineering Thermodynamics; Heat Transfer; Fluid Mechanics; Boiler Principle; Steam Turbine Principle; Pump and Fan.
Module objectives/intended learning outcomes	Module objectives: This course is a comprehensive and applied major of energy and power engineering, with strong characteristics of power production. It focuses on the basic principles of thermal power plants, modern large-scale power plant thermal system and the basic knowledge of auxiliary equipment. This course introduces the methods of qualitative analysis and quantitative calculation of energy balance in power enterprises, the steam pipe of power plant and the comprehensive evaluation of thermal power plant. Specific objectives include: ● Knowledge: Understand the basic knowledge of power plant safety, reliability and environmental protection evaluation; Understand the organic relationship between thermal power plant production process and thermal equipment; Master the basic theory of thermal process and improving thermal economy of power plant; Familiar with the composition of power plant thermal system; Master the basic knowledge of working principle and operation of thermal power system and main auxiliary equipment in power plant. ● Skills: Grasp the meaning and calculation method of the heat method and its thermal economy indexes; Have certain analysis ability of thermal economy of thermodynamic system; Master the general calculation method of the principle thermodynamic system of power plant. ● Competences: Through the study of thermal power plant theory and engineering technology knowledge, students are trained to apply professional theoretical knowledge to engineering practice ability and innovative thinking.
Content	Theoretical teaching (48 contact hours; 87 self-study hours) Introduction (2 contact hours; 3 self-study hours) • The development history of China's power industry; • The trends in thermal power plants; • The common ways and methods to obtain the latest industry and professional information. Chapter 1 Evaluation of Thermal Power Plants (6 contact

	hours; 12 self-study hours) • The four aspects of comprehensive evaluation of power plant; • The environmental pollution in the production process of thermal power plants and its conventional treatment methods; * • The reliability evaluation index of thermal power plant, function of life management, three maintenance modes; • The concept and calculation of thermal energy method for thermal system analysis, and calculation of thermal economy index of power plant; * * • The concept and qualitative analysis of exergy method for thermal system analysis, typical irreversible process in the production process of power plant and the loss caused by it. * * Chapter 2 Methods to Improve Thermal Economy of Thermal Power Plants (6 contact hours; 12 self-study hours) • The influence on thermal economy and engineering application of improving the initial parameters of power plant; * * • The influence on thermal economy and engineering application of reducing the final parameters of power plant; * * • The influence on thermal economy and engineering application of regenerative cycle with steam extraction of power plant; * * • The influence on thermal economy and engineering application of reheat cycle of power plant; * * • The effects of cogeneration and combined cycles on thermal economy of power plants. * Chapter 3 New Power Cycle (2 contact hours; 4 self-study hours) • The working principle and common forms of gas-steam combined cycle; • The working principles and characteristics of nuclear power plants. Chapter 4 Regenerative Heating System to Feedwater (6 contact hours; 12 self-study hours) • The characteristics, structures and basic thermodynamic formulas of the two regenerative heaters; * • The concept of heater end difference; Methods to improve thermal economy of surface heater; * * • The system structure and its thermal economy calculation and analysis of principle regenerative system in thermodynamic theory; * * • The composition and operation of comprehensive regenerative system in engineering practice. Chapter 5 Deaeration System of Feedwater and Auxiliary

	Steam Water System in Power Plant (6 contact hours; 12 self-study hours) • The purpose and methods of removing oxygen from feedwater; * • The principle and conditions of thermal deaeration and the structure of the deaerator; * * • The operation mode of the deaerator and the problems to be considered in the sliding pressure operation; * * • The composition and operation of comprehensive deaeration system in engineering practice ; • The loss of steam water in power plants and the filling water system; * • The continuous blowdown utilization system of boiler and its thermal economic analysis; * • The principles and conditions for working medium recovery and waste heat utilization. Chapter 6 Combined Heat and Power Generation (CHP) (4 contact hours; 10 self-study hours) • The concept, the thermal economic index of CHP station and its sharing method of heat and power; * • The thermal economy analysis of CHP and the coal saving conditions of CHP station; * * • The types and characteristics of heat loads; • The external heating system of CHP station. Chapter 7 Principle Thermal System of Power Plant in Thermodynamic Theory (8 contact hours; 10 self-study hours) • The composition of principle system of power plant in thermodynamic theory; * • The formulation of principle system of power plant in thermodynamic theory; ** • The calculation of principle system of power plant in thermodynamic theory; * Chapter 8 Comprehensive Thermal System of Power Plant in Engineering Practice (8 contact hours; 12 self-study hours) • The basic concepts of piping and valves in power plant; * • The main steam piping system of power plant; * * • The bypass system of steam turbine; * * • The feedwater system and condensate system of power plant ; * • The auxiliary steam system and plant water system of power plant; • The composition of comprehensive thermal system of power plant in engineering practice. *
Study and examination	1. Traditional examination Final score includes: usual performance (No more than 30%);

requirements and forms of examination	final exam (closed book written examination) (No less than70%). Usual performance includes: assignment and attendance and Q&A 2. Process examination Final score includes: Learning outside the classroom：The study of online learning materials (10%); Study report (10%); Homework (10%); Q&A (10%); Learning in the classroom: Attendance and Q&A(10%); Final exam : Closed book written examination(50%)
Media employed	Multimedia computers, Projector, Laser pointers, Blackboard, Chalks
Reading list	1. Required books [1] Zheng Tikuan. Thermal power plant. Beijing: China electric power press, 2001 2. Reference books [1] Wu Xuesu, Gao Nanlie. Problem set of thermal power plant. Beijing: Water conservancy and electric power press, 1994. [2] Shen Weidao. Thermodynamics of engineering. Beijing: Higher education press, 2004 [3] Jian TianCong. Steam turbine principle. Beijing: China power press, 1992 3. Course design books [1] Zheng Puyan, Wang Du, Lu Jianfeng. Course design of thermal power plants. Beijing: China electric power press, 2018 4. Other materials [1]. PPT courseware (self-compiled)

Module designation	
Module level, if applicable	
Code, if applicable	2101091
Subtitle, if applicable	
Courses, if applicable	Central Controlled Operation of Unitized Sets
Semester(s) in which the module is taught	7th semester
Person responsible for the module	Associate professor DING Honglei
Lecturer	Associate professor MA Xinxia Lecturer YAN Ting Lecturer LIU Xiaojing
Language	Chinese
Relation to curriculum	The feature of this course is that the content of the course is based on the main content of the professional core course, which is closely related to the actual production of the power plant, and needs to combine theory and practice closely in the teaching process. Through the study of this course, students can preliminarily apply the knowledge of learned professional courses and related professional basic courses, master the start and stop, operation mode, sequence control logic and interlock protection of large capacity unit, and have the preliminary ability of centralized control operation technology and analysis of operation problems of large capacity unit.
Type of teaching, contact hours	Targeted students: senior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 48 hours Of which Theoretical teaching: 48 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 135 hours Contact hours = 48 hours Self-study hours = 87 hours
Credit points	4.5
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended	Boiler Principle; Steam Turbine Principle; Thermal Power

prerequisites	Plants.
Module objectives/intended learning outcomes	Module objectives: This course is a comprehensive and applied professional course of energy and power engineering, with distinct characteristics of power production. The content of this course mainly includes: unit unit start and stop mode, program, unit coordination control principle and unit operation mode, sequence control logic implementation and working principle, automatic accident handling and interlock protection, etc. Specific objectives include: ● Knowledge: Master the basic procedure of start and stop of large capacity unit, and understand the basic principle and operation mode of main control system of thermal power plant. ● Skills: Start stop mode, program, coordinated control principle and operation mode of unit, logic implementation and operation principle of sequence control, automatic accident handling and interlock protection, etc. of unit. ● Competences: The students can preliminarily apply the knowledge of the major courses they have learned and the basic courses related to them, and have the preliminary ability of centralized control operation technology of large capacity units and analysis of operation problems.
Content	Theoretical teaching (48 contact hours; 87 self-study hours) Chapter 1 Start-up and shutdown of unit (18 contact hours; 32 self-study hours) • Characteristics and mode of start-up and shutdown of unit; • Cold start-up of Supercritical unit • Start-up of unit with drum-boiler • Some problems in start-up • Hot start-up with sliding parameters • Shutdown of unit Chapter 2 Operation adjustment of unit (13 contact hours; 20 self-study hours) • Operation adjustment of boiler • Operation monitoring of steam turbine • Monitoring and maintenance of generator and main transformer • Peak-load regulation of large-capacity thermal power plants Chapter 3 Control modulation of unit (7 contact hours; 17

	self-study hours) • Load regulation mode of unit • Load control system of unit • Operation control mode of unit • Example of unit main control system • Electro-hydraulic regulation of turbine Chapter 4 Sequential control - automatic operation (6 contact hours; 11 self-study hours) • Introduction • Local sequential control system of turbine • Local sequential control system of boiler • Furnace safety supervisory system • Sequence control of boiler soot blowing system Chapter 5 Accident treatment and interlock protection of unit (4 contact hours; 7 self-study hours) • Accident treatment of unit • Interlock protection of unit
Study and examination requirements and forms of examination	1. Traditional examination Final score includes: usual performance (No more than 30%); final exam (closed-book examination) (No less than70%). Usual performance includes: assignment and attendance and Q&A 2. Process examination Final score includes: Learning outside the classroom：The study of online learning materials (10%); Study report (10%); Homework (10%); Q&A (10%); Learning in the classroom: Attendance and Q&A(10%); Final exam : Closed book written examination(50%)
Media employed	Multimedia computers, Projector, Laser pointers, Blackboard, Chalks
Reading list	1. Required books [1]Niu Weidong. Unit operation (third edition) . Beijing: China electric power press, 2013 2. Reference books [1] Luo Wanjin. Automatic regulation of thermal process in power plant. Beijing: Water conservancy and electric power press, 1991. [2] Chen Geng. Automatic regulation of thermal process in power plant. Beijing: China electric power press, 2001 [3] Lin Wenfu, Hu Yan. Automatic control technology of unit. Beijing: China electric power press, 2004

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2403002
Subtitle, if applicable	
Courses, if applicable	Principle of Automatic Control
Semester(s) in which the moduleis taught	5th semester
Person responsible forthemodule	Professor ZHANG Chuanlin
Lecturer	Associate Professor KANG Yingwei Associate Professor JIAZaiyi
Language	Chinese
Relation to curriculum	Principle of Automatic Control is one of the important professional courses in energy and power science and engineering. Due to the continuous cross integration of disciplines, system science and feedback ideas have been more and more widely used in energy and power engineering. This course provides a basic knowledge framework for further mastering energy conversion and control. Based on the requirements of engineering practice, this course mainly introduces the basic analysis and design methods of control system, including the modeling of control system, time domain analysis of first-order and second-order system, root locus of control system, frequency domain analysis method, etc. After learning this course, students can master the basic principles of modeling, system analysis and feedback control of commonly used systems in energy and power engineering and can design closed-loop control system with simple PID controller.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching Contact hours: 32hours Of which Theoretical teaching:26 hours Experiment / practice teaching: 6 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 120hours Contact hours = 32 hours Self-study hours =88 hours

Credit points	4.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Advanced mathematics, Complex functions and integral transformation
Module objectives/intended learning outcomes	After completing the course, students should achieve the following objectives: ● Knowledge: Obtain the basic concepts of the control system, establish the mathematical model of the system and other engineering knowledge; Master the analysis methods of the system's time domain, frequency domain, root locus, state space and other engineering problems; Master the basic design methods of time-frequency domain correction, root locus and state feedback. ● Skills : possess four capabilities that modern control engineers should possess, that is, abstract a specific actual control system as a block diagram with clear concepts; establish a mathematical model of the system using mechanism modeling and experimental modeling; analyze the characteristics and performance parameters of the system using system analysis methods; and initially design a controller to improve the performance of the system using system design methods.Preliminary analysis and design capabilities for complex engineering problems. ● Competences : Set up the thinking mode of system analysis problems, and understand the application examples of control theory in the energy and power industry.Cultivate the spirit of self-study and team work to lay a good foundation for future engineering design, operation, debugging, maintenance, technology development and management in the field of Engineering technology.
Content	I.Theoreticalteaching (26 contact hours; 76 self-study hours) Chapter 1 Overview (2 contact hours, 4 self-study hours) Basic concepts of feedback control systems • Composition and block diagram of automatic control system • Classification of automatic control systems • Performance analysis and requirements of automatic control system Chapter 2 Mathematical model of control system(4contact hours, 12 self-study hours)

	• Basic forms of mathematical models, transfer functions and Laplace transformations • Modeling methods for mechanism analysis • Dynamic characteristics of typical links and PID controller • Equivalent conversion and signal flow diagram of block diagrams Chapter 3 Time Domain Analysis of Control Systems (4 contact hours, 12 self-study hours) • First-order and second-order systems analysis and performance indicators • Impact of zero-pole distribution on system and dynamic response and simplified analysis of higher-order systems • Stability and Algebra Criteria of Control Systems • Steady state error analysis and error coefficient of control system Chapter 4 Root locus analysis and design of control system (4 contact hours, 12 self-study hours) • Basic concepts of root locus • Rules and methods for drawing root locus diagrams • The influence of open-loop zero poles on root locus • Root Track Analysis and Design of Control System Chapter 5 Frequency domain analysis and design of control system (6 contact hours, 18 self-study hours) • Basic concepts of frequency characteristics • Polar Map of Frequency Characteristics • Logarithmic coordinate map of frequency characteristics • Analysis of Nyquistdiagram of control system • Bode diagram analysis of control system • Frequency characteristics analysis of closed-loop system • requency domain design of control system Chapter 6 Analysis and Design of Discrete-Time Control System (4 contact hours, 12 self-study hours) • Basic concepts of discrete-time control systems • Sampling and reproduction of continuous-timesignals • Mathematical model of discrete-time control system • Performance analysis of discrete-timecontrol systems • Design of discrete-timecontrol system Chapter 7 State Space Analysis and Design (2 contact hours, 6 self-study hours) • State Space Model and Stability • Controllability and Observability II. Experiment/practice teaching (6 experiment hours, 12 self-study hours)

	1.Experiment of basic control systems modeling 2.Experiment of performance analysis and PID control 3.Experiment of root locus and frequency analysis
Study and examination requirements and forms ofexamination	Final score includes: usual performance (15%); homework (15%), final exam (closed book written examination) (70%). Usual performance includes: assignment and attendance
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Yang Ping, Weng Siyi, Wang Zhiping, Principle of Automatic Control-Theory Part (3rd Edition). Beijing: China Electric Power Press, 2016 [2] Yang Ping, Yu Jie, Xu Chunmei, Xu Xiaoli. Principle of Automatic Control-Experiment and Application Part. Beijing: China Electric Power Press, 2015 2. Reference books [1] Hu Shousong. Principle of Automatic Control. Beijing: Science Press，2019 [2]Tian Yuping，Jiang Min, Li Shihua. Principle of Automatic Control. Beijing: Science Press，2006

Module designation	Engineering Fundamentals
Module level, if applicable	Skilled
Code, if applicable	2101204
Subtitle, if applicable	
Courses, if applicable	Professional English in Energy and Power Engineering
Semester(s) in which the module is taught	5th semester
Person responsible for the module	Lecturer GUAN Zhenzhen
Lecturer	Lecturer Wang Chengyao Lecturer LI Dong
Language	English & Chinese
Relation to curriculum	Professional English in Energy and Power Engineering covers the main branches of Energy and Power Engineering, such as engineering thermodynamics, fluid mechanics, heat transfer, utility boiler, principles of steam turbine, refrigeration and air conditioning, new energy power generation technology. There is some essential coverage for lessons learned, as well as broaden and extension in content. That helps students to master the professional knowledge in learning English and improve English level while learning expertise, and to obtain the abilities how to express professional knowledge and conduct academic communication using scientific English as well.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 16 hours Of which Theoretical teaching: 16 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 60 hours Contact hours = 16 hours Self-study hours = 44 hours
Credit points	2.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended	Engineering Thermodynamics; Fluid Mechanics; Heat

prerequisites	Transfer.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand the current development situation and trends of this discipline through teaching. Specific objectives include: ● Knowledge:the current development situation and trends of this discipline ● Skills: Students learn the language features of scientific English, and cultivate their writing capacities. ● Competences: Students have five language skills in professional English: listening, speaking, reading, writing and translation, and has the ability of academic communication with English speakers.
Content	Theoretical teaching (16 contact hours; 44 self-study hours) Chapter 1 Engineering Thermodynamics (2 contact hours; 5.5 self-study hours) • Basic concepts and fundamental principles; ** • Equation of state and heat capacities; * • Phase changes of pure liquid; ** • Moist air; * • Steam nozzles; ** • Vapor power cycles in power plant. ** Chapter 2 Engineering Thermodynamics (2 contact hours; 5.5 self-study hours) • Definition of a fluid and classification of fluid flow; ** • The characteristics of fluids; * • Fluid dynamics. ** Chapter 3 Heat Transfer (2 contact hours; 5.5 self-study hours) • Introduction; ** • Modes of heat transfer; ** • Conduction heat transfer; ** • Convection heat transfer; ** • Boiling and condensation heat transfer; ** • Radiation heat transfer; ** • Enhanced heat transfer technology. * Chapter 4 Heat Exchangers (2 contact hours; 5.5 self-study hours) • Classification of heat exchangers; ** • Heat exchanger analysis; ** • Heat exchanger design. * Chapter 5 Boiler (3 contact hours; 8.25 self-study hours) Introduction; **

	• Fuel; ** • Boiler arrangements; ** • Boiler main components; ** • Boiler auxiliaries. * Chapter 6 Turbine (3 contact hours; 8.25 self-study hours) Introduction; ** • Steam turbine system; ** • The modern steam power plant. ** Chapter7 Refrigeration Cycles and Air Conditioning (0.5 contact hours; 1.375 self-study hours) • Refrigeration cycles; * • Air conditioning system. * Chapter8 Nuclear and Renewable Energy (0.75 contact hours; 2.0625 self-study hours) • Nuclear energy; * • Renewable energy. * Chapter 9 Emission Control in Power Plant (0.75 contact hours; 2.0625 self-study hours). • Introduction; * • Particulate removal equipment; * • Sulfur oxides emission control; * • Nitrogen oxides (NOx) emission control; * • System evaluation for IGCC power generation. *
Study and examination requirements and forms of examination	Final score includes: usual performance (30%); final exam (closed book written examination) (70%). Usual performance includes: attendance and assignment.
Media employed	Multimedia computers, blackboard, chalks
Reading list	1. Required books [1] Pan Weiguo, WU Jiang. English in Thermal Energy and Power Engineering. Beijing: China Electric Power Press, 2011 2. Reference books [1] LI Ruiyang. English in Thermal Energy and Power Engineering. Harbin: Harbin Institute of Technology Press,2008 [2] Thermal Energy and Power Engineering Professional English Writing Group. English in Thermal Energy and Power Engineering. Beijing: China Petrochemical Press, 2007 [3] CHENG Leming. Reading and writing for English in Thermal Engineering. Beijing: China Electric Power Press, 2004 [4] YAN Weiping. English in Thermal Energy and Power

	Engineering. Beijing: China Electric Power Press, 2009 3. Other materials [1] PPT courseware (self-compiled)

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Electrical part of power plant
Semester(s) in which the module is taught	5th semester
Person responsible for the module	Lecturer SUN Xin
Lecturer	Lecturer LU Wu Lecturer PAN Xuetao
Language	Chinese
Relation to curriculum	The course will focus on the knowledge related to wiring and equipment of the main electrical system of power plant, focusing on cultivating students' ability to analyze, research and solve complex engineering problems by applying theoretical knowledge.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching Contact hours: 32 hours Of which Theoretical teaching: 32 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 120 hours Contact hours = 32 hours Self-study hours = 88 hours
Credit points	4.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Electrical and Electronic Technology (1)(2)
Module objectives/intended learning outcomes	This course is a professional course that combines theory with practice closely and carries out engineering training for students. ● Knowledge:Its goal is to enable students to systematically learn the electrical wiring forms and operation characteristics of power plants and substations, as well as the

	role, working principles and selection principles of main electrical equipment. ● Skills:Students are required to establish engineering views and preliminarily master the design method of electrical main system in power plants The ability to solve engineering problems has been trained, which lays the necessary theoretical foundation for the future work of design, operation, management and scientific research. ● Competences:The course will focus on the knowledge related to wiring and equipment of the main electrical system of power plant, focusing on cultivating students' ability to analyze, research and solve complex engineering problems by applying theoretical knowledge.
Content	Theoretical teaching (32 contact hours; 88 self-study hours) Chapter 1 Introduction (2 contact hours; 20 self-study hours) Chapter 2 Main electrical connection and its design (6 contact hours; 23 self-study hours) Chapter 3 Principle and selection of conductor and electrical equipment (8 contact hours; 23 self-study hours) Chapter 4 Distribution device (8 contact hours; 22 self-study hours)
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); experiment (10%), final exam (opened book written examination) (70%). Usual performance includes: assignment and attendance and computer practice
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Shihong Miao. Electrical part of power plant. Beijing: China Electric Power Press, 2008 2. Other materials [1]. PPT courseware (self-compiled)

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	2403345
Subtitle, if applicable	
Courses, if applicable	Computer distributed control system
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Associate professor ZHANG Dongliang
Lecturer	Associate professor ZHANG Dongliang
Language	Chinese
Relation to curriculum	By studying this course computer distributed control system, students can understand the basic concept of decentralized control system, systematically grasp the basic structure and function of the decentralized control system, understand the application of the decentralized control system in the centralized control operation of power plant, master the application design process of DCS, such as point configuration, logic configuration, picture configuration, etc., and train students' ability to use the decentralized control system for engineering design.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching：32 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 64 hours Contact hours = 32 hours Self-study hours = 58 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Circuit; Microcomputer principle; Automatic control principle
Module objectives/intended learning outcomes	Module objectives: Through the theoretical teaching and experimental training of this course, students will have the following abilities: Understand the basic concept of the decentralized control system, master the basic structure and function of the decentralized control system, master the realization process of the decentralized control system for the plant object

	control and the application in the centralized control of the power plant. ● Knowledge:Be able to use the distributed control system as a tool to make clear the design objectives and control plans according to the control requirements of specific objects. ● Skills: Master the function of each part of the distributed control system and the principle of monitoring and control, be able to analyze the characteristics of the object and select the research route, and study the acquisition, monitoring and control scheme of process parameters based on the distributed control system. ● Competence:With the distributed control system as a tool, students can master the application design process such as point configuration, logic configuration and picture configuration of the distributed control system, and cultivate the ability of students to use the distributed control system to control and simulate complex industrial processes such as power stations.
Content	Chapter 1 Overview of process control in thermal power plant (4contact hours, 6 self-study hours) • Classification of industrial production process • Overview of control system • Process control of thermal power plant • Development history of control system • Computer control system Chapter 2 Overview of distributed control system 21 (4contact hours, 6 self-study hours) • Overall structure of distributed control system • ardware composition of distributed control system • Software composition of distributed control system • Main links of application of distributed control system Chapter 3 Data acquisition and preprocessing process channel (4contact hours, 6 self-study hours) • Acquisition and conversion of analog data • Switch signal input and output equipment • LN2000 process channel • Pretreatment of analog data • LN2000 system database configuration software Chapter 4 Field control station - main control unit (4contact hours, 8 self-study hours) • Basic composition and function of main control unit (MCU) • The second section is the software of the main control

	unit • Realization of control operation function in main control unit • Implementation of PID algorithm in DCS • rinciple of undisturbed switching and its implementation in DCS • Working state and evaluation elements of process control station Chapter 5 Data display and operation (4contact hours, 8 self-study hours) • Overview of operator station • Monitoring screen • Configuration software of monitoring screen • Trend curve display • Alarm management software • System diagnosis • Historical data records and statements Chapter 6 Data transmission communication network (4contact hours, 8 self-study hours) • Communication network • Communication network in LN2000 • Interconnection and communication between networks • Network interconnection and communication in LN2000 Chapter 7 Data assurance - Reliability Technology (4contact hours, 8 self-study hours) • Reliability index • Reliability test • Reliability analysis and design Chapter 8 DCS Application (4contact hours, 8 self-study hours) • DCS application stage • Design of the main control DCS system of 600MW thermal power unit • Auxiliary system control scheme of 2 × 300MW Thermal Power Unit
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); experiment (10%), final exam (closed book written examination) (70%). Usual performance includes: assignment and attendance and computer practice Experiment score includes: experiment process; experiment report (50%); experiment exam (50%)
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Yongjie Zhai. Principle and application of distributed control system in thermal power plant. Beijing: China

	Electric Power Press, 2010 2. Reference books [1] Dachu Xiao. Technical series of domestic 600MW critical thermal power generating set control equipment and system. Beijing: China Electric Power Press, 2006 3. Other materials [1] PPT courseware (self-compiled)

Module designation	Professional Foundation Courses
Module level, if applicable	
Code, if applicable	2101095
Subtitle, if applicable	
Courses, if applicable	Thermodynamic Testing Technology
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Associate professor Cheng Zhihai
Lecturer	Lecturer Yan Ting
Language	Chinese
Relation to curriculum	Thermodynamic Testing Technology is an optional course for thermal energy engineeringmajor. The course emphasizes the combination of theory and practice, and systematically describes the basic concepts, analytical methods and key technologies fortesting technology of thermal power engineering. The contentsof this course include error analysis, fundamentals of sensors, test application and characteristics of test system.The focuses of this course have been on the working principle of different types of sensors, the ways of error generation and the methods and application in eliminating and reducing errors.
Type of teaching, contact hours	Targeted students: Thermal Energy Engineering Major Type of teaching: Theoretical Teaching, Experiment teaching Contact hours: 32 hours Of which Theoretical teaching: 28 hours Experiment teaching: 4 hours
Workload	Workload= 90 hours Contact hours = 32 hours Self-study hours = 58 hours
Credit points	2.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the examination.

Recommended prerequisites	Advanced Mathematics; Linear Algebra; Probability Theory and Mathematical Statistics; Principle of Automatic Control; Thermodynamics; Engineering Fluid Mechanics; Heat Transfer.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to acquire the basic theory and knowledge of various sensors. Specific objectives include: ● Knowledge: Master the theoretical analysis and elimination methods fortesting errors of different sensors;Be acquainted with the performance characteristics, application scope, interference factors and cost factors of different sensor components in the use process, as well as the data acquisition and transmission process of sensor signals; Understand the basic knowledge and theories of testing technology; Master the general principles of arrangement and installation of practical measuring system in thermal engineering; Be familiar with the applicable range of various sensors and measurement methods; Initial ability to design measurement system based on actual system. Through the study of this course, students can acquire the fundamental principles of testing technology, cultivate their ability to analyze and solve practical problems, and cultivate their ability to independently study and innovate, and expand their ability to apply knowledge. ● Skills: Students acquire basic theoretical and specialized knowledge about testing system and technology; Understand the engineering application of testing technology; Acquire deep understanding of testing technology; Master the application methods for test instrument and combustion measurement; Be able to analyze and solve all kinds of thermal energy engineering measurement problems. ● Competences: Students acquire practical abilities and innovative thinking on the basis of testing theories and engineering technology knowledge.

Content	Chapter 1 Introduction (1.5 contact hours; 2 self-study hours:) • Development process of thermal engineering testing technology • Basic concepts of measurement • Components and classification of measuring instruments • Main performance indexes of measuring instrument Chapter 2 Dynamic characteristics of the testing system (3 contact hours; 5.5 self-study hours) • The meaning of dynamic characteristics for measurement system • The significance and application of transient measurement parameter • Dynamic response of measurement system Chapter 3 Measurement error (3 contact hours; 5.5 self-study hours) • Sources and classification of errors • Systematic errors and random errors • Elimination of random errors • Elimination of suspicious measurement data • Transfer error Chapter 4 Types and working principles of sensors (3 contact hours; 5.5 self-study hours) • Resistive sensor • Inductive sensor • Capacitive sensor • Piezoelectric sensor • Magneto-electric sensor • Thermoelectric sensor • Photoelectric sensor • Hall sensor Chapter 5 Temperature measurement(3 contact hours; 5.5 self-study hours) • Contact thermometer • Non-contact thermometer • Gas thermometer • Application of infrared technology in temperature measurement Chapter 6 Pressure measurement (3 contact hours; 5.5

	self-study hours) • Conventional pressure gauges and sensors • Measurement of airflow pressure • Calibration of pressure instrument • Dynamic characteristics of pressure measuring system Chapter 7 Flow velocity measurement(3 contact hours; 5.5 self-study hours) • Pitot tube flow velocity measurement technology • Hot wire (hot film) flow velocity measurement technique • Laser doppler flow velocity measurement technology • Image flow velocity measurement technique Chapter 8 Flow measurement(3 contact hours; 5.5 self-study hours) • Throttling flowmeter • Turbine flowmeter • Ultrasonic flowmeter • Optical fiber flowmeter • Mass flowmeter Chapter 9 Liquid level measurement (2 contact hours; 4 self-study hours) • Differential pressure level gauge • Electric capacity liquidometer • Resistance level gauge • Optical fiber liquidometer Chapter 10 Measurement of rotate speed, torque and power (2 contact hours; 4 self-study hours) • Measurement of rotate speed • Torque measurement • Power measurement Chapter 11 Gas components measurement and analysis (2 contact hours; 4 self-study hours) • Overview • Chromatographic analyzer • Infrared gas analyzer • Oxygen content measurement • itrogen oxide measurement The experiment/practical teaching of this course (contact hours: 3.5; self-study hours: 5.5): The experiment/practicalteaching of this course consists of

	twoparts:pressure measurement and gas flow measurement experiment. The purpose of the experiment is to understand and master the main factors leading tothe measurement errors in the experimental process and the calibration methods of testing instruments.
Study and examination requirements and forms of examination	Final score includes: usual performance (30%), final examination (closed book written examination) (70%). Usual performance includes the assignment, attendance and experiment score.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Textbook: [1] Yan Zhaoda. Thermal energy and power engineering testing technology. Beijing: China MachinePress, 2005.10 2. Reference books: [1] Jia MinPing, et al. Testing technology. Beijing: Higher Education Press, 2009.5 [2] Cen KeFa, et al.Experimental research methods and measurement technology of boiler combustion. Beijing: China WaterPower Press, 1995 [3] Wu ZhengYi, et al. Testing technology and signal processing. Beijing: TsingHua University Press, 1991 [4] Wang BoXiong, et al. Engineering testing technology. Beijing: TsingHua University Press, 2012.10 [5] Zhang DongFeng, et al. Measurement instruments for thermal energy engineering. Beijing: China Electric Power Press, 2015.8 3. Experiment/practice instruction books [1] Self-compiled teaching materials 4. Other materials [1] PPT courseware (self-compiled)

Module designation	Professional Core Course
Module level, if applicable	Compulsory
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Energy and Air Pollution Control Technology
Semester(s) in which the moduleis taught	6th semester
Person responsible forthemodule	Professor WU Jiang
Lecturer	Professor PAN Weiguo Associate professor LI Fangqin
Language	Chinese
Relation to curriculum	This course is taught in multi-media classroom, supplemented by pictures, engineering examples, and the combination of theory and examples, so that complex content is easy to understand and accept; in the teaching process, combined with the latest research and application results at home and abroad, expand the knowledge and cultivate students' innovation ability.
Type of teaching, contact hours	Classroom theory teaching： 16 hours of classroom teaching, 29 hours of self-study Experimental class duration: 2 hours Class size: 30-40 people
Workload	Workload= 45 hours Contact hours = 16 hours Self-study hours = 29 hours
Credit points	1.5
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed, required teaching experiments are allowed to take the exam.
Recommended prerequisites	Advanced Mathematics, GeneralChemistry, Engineering Thermodynamics, Engineering Fluid mechanics, Heat Transfer and Engineering Combustion
Module objectives/intended learning outcomes	By studying this course, students should master the basic principles and methods of air pollution control, understand the atmospheric environmental problems caused by the combustion of energy fossil fuels, and cultivate students' ability to analyze and solve air pollution problems to form a comprehensive, Regional and systematic thinking on air pollution prevention and control. • Knowledge: Master basic knowledge of air pollution and

	climate change; familiar with manufacturing process and equipment for sulfur oxides and nitrogen oxides removal apparatus •Skills: Master atmospheric diffusion model calculation and application, particle properties and application of measurement technology; be able to work out pollutants removal plan for coal-fired power plant by studying engineering cases of gaseous pollutants control • Competences: By combining theoretical study and practical work, students can improve abilities in design of power plant desulfurization/denitration device, develop problem solving abilities; be able to solve problems of pollutant emission control by using acquired knowledge.
Content	Theoretical teaching (16 contact hours; 29 self-study hours) Chapter 1 Overview of air pollution（1 contact hours，2 self-study hours） • Course overview • Sources of air pollutants • Transmission process of air pollution • Generation mechanism of haze Chapter 2 Impact of air pollution（2 contact hours，4 self-study hours） • Sulfuric acid smog • Photochemical smog • Acid deposition • Global warming and climate change • Ozone layer destruction • Indoor air pollution • Impact of air pollution • Impact of air pollution • Case analysis Chapter 3 Prevention and control of air pollution Regulations and standards system（1 contact hours，2 self-study hours） • Air pollution control regulations and standards system • Air pollution control law of the people's Republic of China • Air environment protection standard system • Environmental air quality standard • Case analysis Chapter 4 Sulfur oxide pollution control（2 contact hours，4 self-study hours） • Sulfur cycle and sulfur emission • Desulfurization technology and process before and

	during combustion • Desulfurization after combustion • Flue gas desulfurization process comprehensive comparison • Acid rain in China Chapter 5 Fixed source NOx pollution control（2 contact hours，4 self-study hours） • NOx properties, sources and effects • Low NOx combustion technology • Flue gas denitrification technology • Flue gas simultaneous desulfurization and denitrification technology • Fixed source NOx control technology evaluation • China's NOx emission control strategy • Flue gas denitrification technology Case analysis of catalytic denitrification Chapter 6 Mobile source NOx pollution control（1 contact hours，2 self-study hours） • Diesel vehicle exhaust emission control technology • Ship NOx emission control technology Chapter 7 Volatile organic compounds control（1 contact hours，2 self-study hours） • Types of organic pollutants (VOCs) and pollution • The status oforganic pollutants (VOCs) • Typical treatment technology of organic pollutants (VOCs) • Typical industry VOCs treatment technology • Case analysis and Politics Policy and regulation Chapter 8 Particle control（2 contact hours，4 self-study hours） • Particle size and particle size distribution • Particle harm and impact • Particle control technology Chapter 9 CO_2 emission reduction and control technology（1 contact hours，1 self-study hours） • Greenhouse effect • Domestic and foreign CO2 emission reduction status • CO2 emission reduction control measures • Case analysis and policy and regulation Chapter 10 Indoor environment Air pollution and control（1 contact hours，2 self-study hours） • Types of indoor environmental pollutants • Sources of indoor environmental pollutants • Control of indoor environmental pollutants

	• Assessment and regulations of indoor environmental pollution Chapter 11 Comprehensive prevention and control of air pollution （1 contact hours，1 self-study hours） • Macro planning of air pollution • Timetable and road map of coordinated control of multiple pollutants implemented by various countries • Active promotion zone Regional air pollution joint prevention and control • Implementation of climate friendly air quality improvement strategy • Case analysis and policy and regulation Chapter 12 Typical case analysis（1 contact hours，1 self-study hours） • International case analysis • Domestic case analysis
Study and examination requirements and forms ofexamination	Normal score (30%), final exam (70%).Usual performance includes: homework attendance and answering questions.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks.
Reading list	1. Required books [1] Yan Weiping, et al. Clean coal power generation technology. Beijing: China Electric Power Press, 2003. 2. Reference books [1] Tang Xiaoyan, et al. Environmental Protection and Sustainable Development. Beijing; Higher Education Press, 2010. [2] Guo Jing, et al. Air pollution control engineering. Beijing; Chemical Industry Press, 2008. [3]Li Xungui, et al.Environment and Sustainable Development. Beijing; Higher Education Press, 2010.

Module designation	
Module level, if applicable	
Code, if applicable	2101012
Subtitle, if applicable	
Courses, if applicable	Gas Turbine and Combined Cycle of Gas and Steam
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Professor Hu Danmei
Lecturer	Associate processor Zheng Puyan Professor Zeng Zhuoxiong Professor Guo Ruitang Lecturer Ying Yulong Lecturer Ding Jiafeng
Language	Chinese
Relation to curriculum	The preceding courses of "Gas Turbine and Combined Cycle of Gas and Steam Principles of Steam Turbines" include Engineering Thermodynamics, Engineering Fluid Dynamics, Heat Transfer, Combustion, Principles of Steam Turbines, etc. The steam turbine part of this course can only introduce its different characteristics from that of conventional steam turbines in thermal power plants.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 32 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 90 hours Contact hours = 32 hours Self-study hours = 68 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Engineering Thermodynamics, Engineering Fluid Dynamics, Heat Transfer, Combustion, Principles of Steam Turbines.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand basic knowledge and analysis method of gas steam combined cycle power generation system through teaching and practice. Specific objectives include:

	● Knowledge: Master basic knowledge of gas turbines in a gas steam combined cycle power generation system, including working principles, structure, cycle mode and calculation, off-design characteristics and operation start-up/speed reduction characteristics. Grasp the principle, structure and characteristics of gas steam combined cycle power generation system. ● Skills: On the basis of understanding of gas turbine and gas steam combined cycle power generation system, master basic theories and principles regarding issues concerning gas turbine and gas steam combined cycle power generation system, such as selection, operation and design. ● Competences: Acquire a full understanding of principles, structure, operation and application of gas turbine and gas steam combined cycle power generation system; prepare for future work and develop a sense of technical innovation.
Content	Theoretical teaching (32 contact hours; 68 self-study hours) Chapter 1 Introduction of Combined Cycle (4 contact hours; 8 self-study hours) • Thermodynamic principles of combined cycle of gas and steam; • Different types and characteristics of combined cycle of gas and steam • Combined cycle of conventional heat recover steam generator (HRSG) Chapter 2 Thermodynamic Cycle of Gas Turbine (6 contact hours; 13 self-study hours) • Main parameters and performance indexes • Characteristics of ideal simple cycle • Characteristics of the actual simple cycle • Design pressure ratio of gas turbine • Introduction to complex cycle • Calculation of the actual simple cycle Chapter 3 Principles of Gas Turbine Components (6 contact hours; 13 self-study hours) • Principles and characteristics of compressor • Principles and characteristics of gas turbine combustor • Principles and characteristics of gas turbine Chapter 4 Structural and operating characteristics of gas turbine in power station (8 contact hours; 18 self-study hours) • Structural characteristics of gas turbine in power station • Operating characteristics of gas turbine in power station • Governing methods of gas turbine in power station

	• Materials for high temperature components of gas turbines Chapter 5 Other thermodynamic equipment and unit arrangement of the combined cycle (4 contact hours; 8 self-study hours) • HRSG of combined cycle of gas and steam • Steam turbine of combined cycle of gas and steam • Main auxiliary equipment and system of combined cycle of gas and steam • Layout plan of combined cycle of gas and steam Chapter 6 Operation and governing of Combined Cycle (2 contact hours; 4 self-study hours) • Start-up of gas turbine • Start-up of combined cycle • Governing of gas turbine • Governing of combined cycle Chapter 7 Typical Coal Fired Combined Cycle(1 contact hours; 2 self-study hours) • Coal-Fired Fluidized Bed Combustion Combined Cycle • Integrated gasification combined cycle
Study and examination requirements and forms of examination	Final score includes: usual performance (30%); final exam (closed book written examination) (70%). Usual performance includes: assignment (15%) and attendance (15%).
Media employed	Microphone , multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Yao Xiuping. Gas Turbine and Combined Cycle Power Generation. Beijing: China Electric Power Press, ISBN：978-7-5083-9960-7，2013 2. Reference books [1] Jiao Jianshu. Theoretical Basis of Gas-Steam Combined Cycle. Beijing: Tsinghua University Press, ISBN：7-302-0-6950-6，2003 [2] Yang Shunhu. Gas-steam Turbine and Combined Cycle Power Generation Equipment and Operation. Beijing: China Electric Power Press, 978-7-5083-1444-0，2003 3. Other materials [1]. PPT courseware (self-compiled)

Module designation	
Module level, if applicable	
Code, if applicable	2101016
Subtitle, if applicable	
Courses, if applicable	Digital Electro-Hydraulic Control Technology and Its Application
Semester(s) in which the moduleis taught	6th semester
Person responsible forthemodule	Professor ping He
Lecturer	Lecturer Yulong Ying
Language	Chinese
Relation to curriculum	This course is aimed at undergraduate students majoring in energy and power. This course mainly aims at the present power plant steam turbine control system, and applies the advanced control theory and intelligent decision method to the power plant steam turbine operation control. This course is based on engineering practice, systematically introduces the basic principles, composition and working characteristics of the steam turbine digital electro-hydraulic control system, and lays the necessary theoretical foundation for the future operation, management, test, adjustment, transformation and scientific research of the energy power industry, while paying attention to cultivating students' ability to analyze and solve problems.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 16 hours Of which Theoretical teaching: 16hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 45 hours Contact hours = 16 hours Self-study hours = 29 hours
Credit points	1.5
Requirements according to the examination	Only students with class attendance rate over 2/3are allowed to take the exam.

regulations	
Recommended prerequisites	Automatic Control Principle and System; Steam Turbine Principle; Computer Decentralized Control System; Boiler Principle
Module objectives/intendedlearning outcomes	Module objectives: The task of this course is to enable students to master the basic principles, composition and working characteristics of the steam turbine digital electro-hydraulic control system. Specific objectives include: ● Knowledge: Understand the development process and application field of digital electro-hydraulic control technology, the basic concept of digital electro-hydraulic control of steam turbine. Master the working principle, composition and main characteristics of steam turbine digital electro-hydraulic control system. ● Skills: Students can use the basic theory of digital electro-hydraulic control technology to analyze the control logic, working principle and main characteristics of steam turbine digital electro-hydraulic control system, and can operate and test the power plant control system with the theory they have learned in practical operation. ● Competences: Develop students' ability to analyze and solve problems. Combined with the control theory and the basic theory of steam turbine equipment and system, it can analyze the practical problems, put forward the solution strategy, innovate the thinking, and lay the necessary theoretical foundation for the future operation, management, test, adjustment, transformation and scientific research.
Content	Theoretical teaching (16 contact hours; 29 self-study hours) Chapter 1 Overview of Digital Electro-hydraulic Control System for Steam Turbine (2 contact hours; 3 self-study hours) • Development of steam turbine control system • Steam turbine control system • Composition and Function of Digital Electro-hydraulic Chapter 2 Control System of Steam Turbine(2 contact hours; 3 self-study hours) • Brief introduction of steam turbine body • Composition of DEH system • Functions of DEH system Chapter 3Hydraulic control system (2 contact hours; 3 self-study hours) • High pressure resistant fuel oil supply system • Hydraulic actuators

	• Critical blocking system Chapter 4 DEH Speed Control System (2 contact hours; 6 self-study hours) • Section 1 General appearance of DEH automatic adjustment system • Section 2Speed regulation system Chapter 5 DEH Power Regulating System (2 contact hours; 5 self-study hours) • Formation principle of load target value and load set value • Formation principle of SETPOINT% • Load control system analysis • Logic of control mode • Startup state and warm-up logic • tartup mode and operation logic Chapter 6 Valve control and management (2 contact hours; 3 self-study hours) • Valve position control • Valve test Chapter 7 Steam turbine protection system (2 contact hours; 3 self-study hours) • Steam turbine lock and trip logic • Function of overspeed protection and load imbalance Chapter 8 Autostart function (2 contact hours; 3 self-study hours) • Parameter detection function • Stress calculation • Control procedures
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (70%). Usual performance includes: assignment and attendance
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Aiqin Jiang; Xiufang Hao. Digital Electro-hydraulic Regulation and Bypass Control System. Beijing: China Electric Power Press ,2006. 2. Reference books [1] Zhiping Jin.Power plant steam turbine principle and system. Beijing: China Electric Power Press ,2011. [2] Shuangxin Wang et al. Steam turbine digital electro-hydraulic control system. Beijing: China Electric Power Press ,2004.8

	4. Other materials [1] PPT courseware

Module designation	Professional Elective
Module level, if applicable	
Code, if applicable	2101190
Subtitle, if applicable	
Courses, if applicable	Supercritical and Ultra-Supercritical Unit
Semester(s) in which the module is taught	7th semester
Person responsible for the module	Lecturer Li Qingwe
Lecturer	Lecturer Li Qingwe
Language	Chinese
Relation to curriculum	The prerequisites for this course must have relevant professional basic courses, including fluid mechanics, engineering thermodynamics, heat transfer, theoretical mechanics, material mechanics, metallurgy, and automatic control principles. Training, and based on this, completed the professional courses such as boiler principles, steam turbine principles, and thermal power plants; this course directly faces the first-line production links, and is an important professional course that reflects modern advanced power generation technology.
Type of teaching, contact hours	For students: energy and power engineering junior lecture; format: theory teaching ; contact time :32 class hours
Workload	Workload = 90 hours Contact hours = 32 hours Self-study time = 58 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	The prerequisites for this course must have relevant professional basic courses, including fluid mechanics, engineering thermodynamics, heat transfer, theoretical mechanics, material mechanics, metallurgy, and automatic control principles. And students are required to have passed the training of professional knowledge practice, and based on this, they have completed the professional courses such as boiler principle, steam turbine principle, and thermal power plant.

Module objectives/intended learning outcomes	This course is taught to undergraduates majoring in energy and power engineering, and is an elective course for energy and power majors. Through the study of this course, you can comprehensively understand and master the latest achievements in the development and application of supercritical and ultra-supercritical coal-fired power generation technologies, including main equipment such as supercritical, ultra-supercritical boilers and steam turbines, and related thermal systems. And auxiliary machines. Through the case introduction of parameter selection, material application, water vapor chemical treatment control, and unit installation, commissioning, operation, maintenance, performance assessment, etc., students can fully understand and master supercritical and ultrasupercritical coal combustion. Power generation technology. ● Knowledge: enable students to fully understand and master supercritical and ultra-supercritical coal-fired power generation technology ● Skills: Through classroom explanations, students can master the basic concepts, principles and structural work characteristics of main equipment ● Competences: to help students master key points, develop self-study and independent analysis of problems
Content	Chapter 1 Overview of supercritical coal power generation technology (4 contact hours; 6 self-study hours) • physical meaning and thermodynamic characteristics of supercritical parameters • the influence of supercritical parameters on the thermal economy of the system, the influence of lifting pressure and the influence of lifting temperature • the negative impact of supercritical parameters on the system, and the main problems that supercritical units need to face and solve are special • main parameters selection and comprehensive optimization of supercritical unit • selection of materials for supercritical unit;The first part (super) supercritical parameter boiler equipment and operation Chapter 2 Development background and trend of supercritical and ultra-supercritical boilers in coal-fired power stations (2 contact hours; 4 self-study hours) • development background of supercritical parameter boiler

	• technical performance of ultra-supercritical boiler Chapter 3 Basic types and principles of supercritical and ultra-supercritical boilers (2 contact hours; 4 self-study hours) • arrangement characteristics of heating surfaces of supercritical and ultra-supercritical parameter boilers • influence of furnace structure on boiler performance • structure and arrangement of evaporation heating surface of supercritical dc boiler Chapter 4 Technical characteristics of supercritical and ultra-supercritical boilers (2 contact hours; 4 self-study hours) • technical performance of supercritical and ultra-supercritical parameter boilers • typical arrangement of water cooled walls of supercritical and ultra-supercritical boilers • operation flexibility and reliability of supercritical boiler Chapter 5 Heat transfer and hydrodynamic characteristics of supercritical and ultra-supercritical boilers (3 contact hours; 5 self-study hours) • analysis of hydrodynamic instability of water wall of supercritical dc boiler and countermeasures • analysis and countermeasures of water wall flow pulsation of supercritical dc boiler • analysis of water wall thermal deviation of supercritical dc boiler and countermeasures • analysis and countermeasures of the deterioration of heat transfer in water wall of supercritical dc boiler Chapter 6 Combustion equipment for supercritical and ultra-supercritical boilers (2 contact hours; 4 self-study hours) • stable combustion technology without oil under low load • technical characteristics of LNCFSTM combustion system • technical characteristics of typical low NOx burners such as LNASB burners and ht-nr burners Chapter 7 Start-up system and start-up characteristics of supercritical and supercritical boilers (2 contact hours; 4 self-study hours) • the main task, type, composition and working process of dc boiler start-up bypass system • starting mode and steps of dc boiler • comparison of the characteristics of the two typical

	startup systems Chapter 8 Operation regulation of supercritical dc boiler (2 contact hours; 4 self-study hours) • operation regulation characteristics of supercritical dc boiler • steam temperature regulation, pressure regulation and feed water regulation of supercritical dc boiler • combustion regulation method of supercritical dc boiler • variable load operation mode of supercritical boiler Chapter 9 Influence of ultra-supercritical parameters on steam turbine and its thermal system (3 contact hours; 5 self-study hours) • the effect of ultra-supercritical parameters on thermal economy of the unit • the influence of ultra-supercritical parameters on the turbine equipment • the influence of ultra-supercritical parameters on the thermal system and equipment Chapter 10 Basic structure of ultra-supercritical turbine body (3 contact hours; 5 self-study hours) • basic structure of supercritical turbine stage and its dynamic and static clearance • supercritical turbine cylinder structure and its support • rotor structure and working characteristics of supercritical turbine • sliding pin system of supercritical steam turbine and its monitoring method Chapter 11 Advanced steam distribution method and its application in ultra-supercritical steam turbine (2 contact hours; 4 self-study hours) • application of traditional steam distribution method in ultra-supercritical steam turbine • application of advanced steam distribution method in ultra-supercritical steam turbine • slip pressure operation of ultra-supercritical steam turbine and its improvement. Chapter 12 Solid particle erosion of ultra-supercritical unit and its prevention (2 contact hours; 4 self-study hours) • the generation of solid particles and their changing rules; • erosion of solid particles in ultra-supercritical units on the through-flow part of the turbine and its causes • comprehensive preventive measures for solid particle erosion by ultra-supercritical Chapter 13 Overview of the thermal system of

	ultra-supercritical turbines (2 contact hours; 4 self-study hours) • condensate water system of ultra-supercritical units and its improvement • main types and operating characteristics of the bypass system of ultra-supercritical units • feed pump set and water supply system of ultra-supercritical unit
Study and examination requirements and forms of examination	The exam is in the form of a closed book. The exam questions include the understanding of basic concepts and theories, the analysis of practical technical problems, and the application of countermeasures, with a ratio of about 5:5. General evaluation results according to the usual results (including attendance, spot check and answer questions, accounted for 20-30%) and final examination results (accounted for 70-80%) comprehensive determination.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Teaching materials: [1] Fan Quangui, editor. Design and operation of ultra-supercritical boilers. Beijing: China Electric Power Press, 2010. [2] Hu Niansu, editor. Turbine equipment system and its operation. Beijing: China Electric Power Press, 2010. reference book: [1] Fan Guiquan, chief editor. Ultra-supercritical and supercritical parameter boilers. Beijing: China Electric Power Press, 2000. [2] Editor Ding Jiafeng. Training Materials for Ultra-Supercritical Thermal Power Units (Steam Turbine Volume). Beijing: China Electric Power Press, 2013.

Module designation	Professional Elective
Module level, if applicable	
Code, if applicable	2101223
Subtitle, if applicable	
Courses, if applicable	Principle of Condition Monitoring and Diagnostics for Power Equipments
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Lecturer Yulong Ying
Lecturer	
Language	Chinese
Relation to curriculum	This course is based on mathematical processing methods such as advanced mathematics, linear algebra, probability theory, and mathematical statistics, as well as professional basic knowledge such as engineering thermodynamics and operating principles of various types of equipment in power plants. By comprehensively applying the knowledge that has been learned, and applying application modeling and algorithm design, students are given a comprehensive and systematic training of independent working ability. Based on the combination of qualitative and quantitative, this course focuses on quantitative analysis, mathematical abstraction of practical problems, establishment of state monitoring diagnostic models and algorithm design and implementation.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching Contact hours: 90 hours Of which Theoretical teaching: 32 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 90 hours Contact hours = 32 hours Self-study hours = 58 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, and having completed required teaching experiments are allowed to take the exam.
Recommended	Calculus; College Physics; Engineering

prerequisites	Thermodynamics; Engineering Fluid Mechanics; Heat Transfer; Probability and Statistics.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand The fault mechanism, fault diagnosis principle and fault prediction principle of thermal equipment through teaching and practice. Specific objectives include: ● Knowledge: By studying this course, students can understand the basic process of energy power system condition monitoring and fault diagnosis. In particular, it focuses on understanding the current mainstream method of equipment condition monitoring and fault diagnosis based on signal processing, equipment condition monitoring and fault diagnosis based on thermodynamic model, and equipment condition monitoring and fault diagnosis based on data-driven method. ● Skills: Combining the theory of dynamics and thermodynamics, students can understand the mechanism and main causes of equipment failures, and master common fault signal analysis and processing methods. ● Competences: Students acquire practical abilities and innovative thinking on the principle of condition monitoring and diagnostics for power equipments.
Content	Theoretical teaching (32 contact hours; 58 self-study hours) Chapter 1 Configuration of remote monitoring and diagnosis system for energy power system (4 contact hours; 8 self-study hours) • The concept of energy power system; • Operation principle of common energy power equipment; • Hardware and software configuration of remote monitoring and diagnosis system; • Basic process of energy power system condition monitoring and fault diagnosis. Chapter 2 Analysis of equipment failure mechanism and characteristics (4 contact hours; 10 self-study hours) • Common faults of energy power equipment; • Causes of failure of energy power equipment; • Mechanism of failure; • Fault external characteristics; Chapter 3 Fault signal analysis and processing method (6 contact hours; 10 self-study hours) • Time domain analysis;

	• Amplitude range analysis method; • Frequency domain analysis method; • Correlation analysis method; • Trend analysis method; • Time-frequency domain analysis; • Nonlinear Signal Analysis Method; • Oil analysis method; Chapter 4 Signal processing-based condition monitoring and diagnosis method (6 contact hours; 10 self-study hours) • Feature extraction algorithm introduction; • Entropy feature; • Holder coefficient characteristics; • Simple fractal box dimension feature; • Improved fractal box dimension feature; • Multifractal dimension feature; • Gray relation theory; • Entropy weighted gray relation theory. Chapter 5 Condition monitoring and diagnosis method based on thermodynamic model (6 contact hours; 10 self-study hours) • Thermodynamic principles of energy power equipment; • Thermodynamic modeling method for common energy power equipment; • Definition of equipment health parameters; • Connotation of gas path diagnosis concept; • Principles and basic steps of condition monitoring diagnosis based on thermodynamic model; • Principle and basic steps of condition monitoring diagnosis based on intelligent optimization algorithm; Chapter 6 Data-driven condition monitoring and diagnosis method (6 contact hours; 10 self-study hours) • Principle and basic steps of condition monitoring diagnosis based on multi-dimensional feature extraction; • Principles and basic steps of condition monitoring diagnosis based on evidence fusion theory; • Principles and basic steps of condition monitoring diagnosis based on gray relation theory; • Principles and basic steps of state monitoring diagnosis based on neural network;
Study and examination requirements and forms of examination	Final score includes: usual performance (20%);final exam (closed book written examination) (70%). Usual performance includes: assignment and attendance and computer practice
Media employed	Multimedia computers, projector, laser pointers, blackboard,

	chalks
Reading list	1. Required books [1] Ying Yulong, Li Jingchao. Research on Fault Diagnosis and Prognosis of Gas Turbine [M]. Science Press (in China), 2020. 2. Reference books [1] Zhijian Huang. Monitoring and Diagnosis of Mechanical Equipment Vibration Faults (Second Edition). Chemical Industry Press, 2nd Edition (April 1, 2017). [2] Yaguo Lei. Intelligent Fault Diagnosis and Remaining Life Prediction of Rotating Machinery. Xi'an Jiaotong University Press; 1st edition (April 1, 2017). [3] Lingling Zhang. Frontiers of Mechanical Engineering Series: Case Tutorial of Mechanical Fault Diagnosis Technology Based on MATLAB. Higher Education Press; 1st edition (November 1, 2016). [4] Xiaosheng Si, Changhua Hu. The theory and application of data-driven equipment remaining life prediction. National Defense Industry Press; 1st edition (April 1, 2016).

Module designation	Professional Elective
Module level, if applicable	
Code, if applicable	11000740
Subtitle, if applicable	
Courses, if applicable	Heat Recovery Generator
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Lecturer Li Qingwei
Lecturer	Lecturer Li Qingwe
Language	Chinese
Relation to curriculum	The teaching object of this course is the energy and power engineering undergraduates, belong to the professional elective courses of this course is based on the principles of boiler based mechanical drawing and structural mechanics, mechanical design and principle of boiler principle repeated allot part of this course is the main content involves the key technology of waste heat utilization technology of waste heat boiler working characteristic structure calculation and calculation of ontology, including both basic knowledge, and reflects the new progress and new technology in the field of students through learning this course, should know the new waste heat power generation technology of waste heat boiler waste heat boiler furnace wall structure, familiar with the waste heat boiler thermodynamic calculation Similarities and differences between water cycle calculation and large coal-fired boiler, master the key technologies and working characteristics of waste heat power generation, have certain research and development and design capabilities
Type of teaching, contact hours	For students: energy and power engineering junior lecture; format: theory teaching; contact time :32 class hours
Workload	Workload = 90 hours Contact hours = 32 hours Self-study time = 58 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended	This course is based on boiler principles, fundamentals of

prerequisites	mechanical design, mechanical drawing, and structural mechanics.
Module objectives/intended learning outcomes	This course is taught to undergraduate students of energy and power engineering, which is a professional elective course. ● Knowledge:Through this course, students should understand the new waste heat power generation technology, waste heat boiler furnace wall, waste heat boiler frame, familiar with the thermal calculation of waste heat boiler, the similarities and differences between water cycle calculation and large coal-fired boiler, ● Skills:master the key technologies and working characteristics of waste heat power generation ● Competences:have certain research and development and design capabilities.
Content	Chapter 1 Structural design of waste heat boiler (8 contact hours; 15 self-study hours) • structural design of radiant cooling chamber, structural design of convection heating surface, structural material of furnace wall and structural material of boiler frame • structure calculation of supporting square, external structure and separation element of the pot barrel • supplementary combustion conditions and effects, influences of supplementary combustion on the circulation system, numerical simulation and optimization of the through-flow structure Chapter 2 Design and calculation of waste heat boiler body (8 contact hours; 15 self-study hours) • some Suggestions on the thermodynamic calculation method of waste heat boiler • calculation of friction resistance, calculation of local resistance, calculation of ventilation resistance of flue gas scour tube bundle, calculation of flue gas self-ventilation • safety design criteria for anti-brittle fracture, theoretical basis for strength calculation, selection of basic parameters for strength calculation, strength calculation of cylindrical elements under internal pressure, and strength calculation of flat plate with tensile member • principle of flue gas phase transformation heat, application of phase transformation heat and waste heat utilization technology, design of condensing boiler. Chapter 3 Computer aided design and calculation software of waste heat boiler (8 contact hours; 14 self-study hours) • computer-aided thermodynamic calculation and computer-aided resistance calculation

	• computer-aided water cycle calculation and computer-aided strength calculation. Chapter 4 Study and design of external working characteristics of waste heat boiler (8 contact hours; 14 self-study hours) • ash accumulation characteristics, wear characteristics, corrosion characteristics of waste heat boiler • smoke and dust separation technology, smoke and dust separation equipment, ash cleaning technology and equipment, ash removal equipment
Study and examination requirements and forms of examination	The final exam will cover the understanding, analysis and application of key technologies, structural design and working characteristics of the waste heat boiler.The total score is determined according to the usual results (including attendance, homework, accounting for no more than 30%) and the large homework or final exam (accounting for no less than 70%).
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Textbook: [1] zhao qinxin. Research and design of waste heat boiler, Beijing: China standard press, 2010. Reference: [1]Shan zhishu. Equipment and operation of Waste heat boiler boiler. Beijing: China electric power press, 2015. [2]Beijing Nonferrous Metallurgical Design & Research Institute.Design and operation of waste heat boiler. Beijing: metallurgical industry press, 1982.

Module designation	Professional foundation course
Module level, if applicable	
Code, if applicable	2101152
Subtitle, if applicable	
Courses, if applicable	Power generation technology on Renewable energy
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Associate Professor Liu Jianquan
Lecturer	
Language	Chinese
Relation to curriculum	The course is based on advanced mathematics, linear algebra, probability theory and mathematical statistics, general physics, This paper mainly introduces the principle, the latest progress, the main problems and Countermeasures of renewable energy. It is divided into renewable energy introduction, traditional fossil energy issues review, solar energy, wind energy, biomass energy, hydrogen energy and other renewable energy, and related fuel cells, chemical cells, as well as various energy storage technologies and other chapters.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching, Experimental teaching Contact hours: 16 hours Of which Theoretical teaching: 14 hours Experiment / practice teaching:2 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 45 hours Contact hours = 16 hours Self-study hours = 29 hours
Credit points	1.5
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Heat transfer, hydrodynamics, engineering thermodynamics
Module	Energy problem is a hot and difficult problem in the world.

objectives/intended learning outcomes	The research and development level of renewable energy is an important factor restricting the future development of all countries in the world, and also plays an important role in the sustainable development of China. This course closely relies on the national energy development strategy and keeps pace with the times, so that students can fully understand and master the renewable energy power generation technology, lay the foundation for future work and further learning, with a view to reserving knowledge and talents for China's sustainable development and even the world's progress. • Knowledge: Master general working principles and design methods for solar energy, wind energy, biomass energy and nuclear power, as well as knowledge about related energy equipment • Skills: Enable students to understand operating mechanism of solar energy, wind energy, geothermal energy, biomass energy, ocean energy, nuclear power, hydrogenic energy and other forms of new energy; student are able to work out rational new energy development plan according to different regional needs and calculate relevant economic benefits. • Competences: Develop abilities in new energy equipment design and process optimization; be able solve problems by using acquired knowledge in future work and study.
Content	Theoretical teaching (16 contact hours; 29 Self-study hours) Chapter 1 Energy Overview (2 Contact hours; 4 Self-study hours) • global energy reserve and sustainable development strategy • classification and basic characteristics of energy • China's energy structure, reserves and sustainable development strategy Chapter 2 renewable energy power generation technology and its development at home and abroad (2 Contact hours; 4 Self-study hours) • renewable energy and main features • application of global renewable energy power generation technology • renewable energy structure and application status in China • significance of renewable energy conversion and control technology Chapter 3 power conversion and control technology (2 Contact hours; 4 Self-study hours)

	• power electronic devices and Applications • AC-DC conversion circuit • DC-DC conversion circuit • DC-AC conversion circuit • AC-AC converter and multi-level compound converter • driving and protection circuits of semiconductor power devices Chapter 4 solar, photovoltaic power generation and control technology (2 Contact hours; 4 Self-study hours) • basic knowledge of solar energy • solar photovoltaic conversion • solar power generation system • application and development of solar power generation at home and abroad • introduction to solar thermal power generation system Chapter 5 wind energy, wind power generation and control technology (2 Contact hours; 4 Self-study hours) • characteristics of wind and application of wind energy • wind turbine and working principle • control strategy of wind turbine • rid connected operation and power compensation of wind turbine Chapter 6 conversion and control technology of biomass energy (2 Contact hours; 4 Self-study hours) • overview of biomass energy resources • biomass direct combustion power generation • biomass gasification power generation • iogas power generation and urban domestic waste power generation • cost and electricity price analysis of biomass power generation Chapter 7 other energy generation technologies (2 Contact hours; 4 Self-study hours) • hydropower generation and control technology • marine power generation and control technology • eothermal power generation and Application Technology • prospect of renewable energy power generation technology
Study and examination requirements and forms of examination	The final examination questions include the understanding of concept and theory, application and analysis, application of algorithm, analysis and calculation of simple renewable energy power generation technology. The ratio is about 2:5:2:1. The total score is determined according to the usual performance (including attendance rate, homework, mid-term

	performance, etc., no more than 30%) and the final exam performance (no more than 70%).
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Required books: [1] Huijing, new energy conversion and control technology, China Machine Press, 2008 [2] Yao Xingjia, renewable energy and power generation technology, Science Press, 2010

Module designation	
Module level, if applicable	
Code, if applicable	2101020.01
Subtitle, if applicable	
Courses, if applicable	Clean coal technology
Semester(s) in which the module is taught	7th semester
Person responsible for the module	Professor Jianxing Ren
Lecturer	Lecturer Zhenzhen Guan
Language	Chinese
Relation to curriculum	Clean coal technology is one of the major elective courses for undergraduates majoring in energy and power engineering. Its purpose is to master coal combustion performance, pollutant formation mechanism, Pollutant emissions, environmental impacts, and technical measures to control pollution emissions. Clean coal technology courses are based on boiler principles and engineering combustion.
Type of teaching, contact hours	Type of teaching: theoretical teaching Theoretical teaching: 16 hours Size of class: No more than 80 people for theoretical teaching
Workload	Workload= 45 hours Contact hours = 16 hours Self-study hours = 29 hours
Credit points	1.5
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, can take the exam.
Recommended prerequisites	Boiler principle; Engineering combustion.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to make students understand the process and methods of coal cleaning. Specific objectives include: ● Knowledge:Master the basic theory and professional knowledge of this course, coal combustion dynamics, coal combustion characteristics, pollutant generation mechanism, and pollutant emission control technology. ● Skills:The learning of this course can improve the ability

	to analyze and solve various engineering problems. ● Competences:cultivate students' creative thinking.
Content	Theoretical teaching (16 contact hours; 29 self-study hours) Chapter 1 Energy Structure and Characteristics of China (2 contact hours; 3 self-study hours) • Energy classification • Primary energy consumption structure • Coal characteristics Chapter 2 Coal Combustion and Environmental Pollution (2 contact hours; 4 self-study hours) • Coal combustion characteristics • Air pollution problems • Environmental impact of coal combustion Chapter 3 Atmospheric Environmental Protection and Standards (2 contact hours; 2 self-study hours) • Environmental protection technology • tmospheric environmental standards • Pollutant discharge standards Chapter 4 Pretreatment of Coal Combustion (2 contact hours; 4 self-study hours) Chapter 5 Control of Sulfur Dioxide in Coal Combustion (3 contact hours; 6 self-study hours) • Coal combustion process • Sulfur dioxide generation mechanism • Control method Chapter 6 Control of NOx in Coal Combustion (3 contact hours; 6 self-study hours) • Nitrogen oxide formation mechanism and control method • Control method Chapter 7 Control of Coal Combustion Dust (2 contact hours; 4 self-study hours) • Dust formation mechanism • Control method
Study and examination requirements and forms of examination	Final grade: final exam (100%).
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] ZHUO Jiankun, CHEN Cao, YAO Qiang. Clean Coal Technology. Beijing: Chemical Industry Press, 2016 2. Reference books

	[1] ZHAO lian, XU Zhenliang. Introduction to Clean Coal Technology. Shenyang: Northeast University Press, 2011 [2] ZHANG Minyao. Clean Coal Power Generation Technology and Engineering Application. Beijing: Chemical Industry Press, 2010.

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Air Conditioning
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Professor LIU Fang
Lecturer	Lecturer DUAN Rui Lecturer Liu Jiang
Language	Chinese
Relation to curriculum	This course is one of the extended optional courses for undergraduates of Energy and Power Engineering program. It is designed for the direction of energy conservation and energy management. It is to enable the students to obtain the ability to analyze and solve practical problems in air conditioning technology.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 90 hours Of which Theoretical teaching: 32 hours Experiment / practice teaching: 58 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 90 hours Contact hours = 32 hours Self-study hours = 58 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Engineering Thermodynamics; Engineering Fluid Mechanics; Heat Transfer.
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand Air conditioning process and systems through teaching.. Specific objectives include:

	● Knowledge: Master the physical properties of moist air and psychrometric chart, air conditioning load calculation, air conditioning, air conditioning system, air purification and quality control of the air conditioning room, air distribution and air conditioning knowledge of domestic and foreign advanced technology and experience. Understand noise elimination and anti-vibration of air conditioning system, fireproof and exhaust smoke of air conditioning and building and so on. ● Skills: Students acquire basic theoretical and specialized knowledge about air conditioning; understand engineering application of air conditioning purification system; acquire deep understanding of air conditioning system; master calculation methods for air conditioning load and air supply volume. Be able to analyze and solve all kinds of air conditioning engineering problems including analysis and improvement of thermal comfort, reducing energy consumption and noise. ● Competences: Students acquire practical abilities and innovative thinking on the basis of air conditioning and engineering technology knowledge.
Content	1. Theoretical teaching (32 contact hours; 58 self-study hours) Chapter 1 physical properties of wet air and its enthalpy diagram (4 contact hours; 8 self-study hours) • physical properties of wet air • enthalpy diagram of wet air • wet bulb temperature and dew point temperature • application of enthalpy and humidity diagram Chapter 2 Air conditioning load calculation and air supply volume (4 contact hours; 8 self-study hours) • indoor and outdoor air calculation parameters; • thermal effect of solar radiant heat on buildings; • heat gained from envelope and cooling load formed; • cooling load and wet load formed by heat dissipation and moisture dissipation of indoor heat source and wet source; • determination of air volume in the air-conditioned room. Chapter 3 Heat and humidity treatment of air (8 contact hours; 16 self-study hours) • air heat and humidity processing method and equipment types; • heat and moisture exchange in direct contact between air and water;

	• air treatment through spray chamber; • air treatment through surface heat exchanger; • other air heating and humidifying methods; • other air dehumidification methods. Chapter 4 Air conditioning system (8 contact hours; 12 self-study hours) • classification of air conditioning systems; • determination of new air volume and air balance; • general centralized air-conditioning system; • ariable air volume system; • semi-centralized air-conditioning system; • local air conditioning unit. Chapter 5 Air distribution in an air-conditioned room (4 contact hours; 8 self-study hours) • flow law of air jet; • exhaust (return) air flow in the tuyere; • air distributor and room airflow distribution; • calculation of airflow distribution in room; • evaluation of airflow distribution performances. Chapter 6 Air purification and quality control (2 contact hours; 4 self-study hours) • purification requirements for suspended particulates in air in inner space; • haracteristics of aerosols and their trapping principle; • air filter; • air purification system. Chapter 7 Air conditioning system noise elimination, anti-vibration and fire prevention and exhaust of air-conditioned buildings (2 contact hours; 2 self-study hours) • noise and its physical measurement; • subjective evaluation of noise and indoor noise standards; • types and applications of mufflers; • anti-vibration of air conditioner; • fire prevention and smoke emission of air-conditioned buildings.
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); final exam (closed book written examination) (80%). Usual performance includes: assignment and attendance from online education
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks

Reading list	1. Required books [1] Zhao Rongyi, Fan Cunyang, Xue Dianhua, Qian Yiming, Air conditioning, Beijing: China Construction Industry Press, Fourth Edition 2. Reference books [1] ASHARE Handbook, ASHARE Inc. 2005 4. Other materials [1] PPT courseware (self-compiled)

Module designation	
Module level, if applicable	
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Introduction of distributed energy systems
Semester(s) in which the module is taught	6th semester
Person responsible for the module	
Lecturer	Professor REN Hongbo
Language	Chinese
Relation to curriculum	The base of the course is advanced mathematics, engineering thermodynamics, engineering fluid mechanics, refrigeration and air-conditioning principle and heat transfer ,etc.. Students are required to grasp the basic principles of Engineering Thermophysics in the above-mentioned basic courses. In addition, they are required to pass the training of production practice.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: Multimedia teaching Contact hours: 32 hours
Workload	Workload =90 hours Contact hours = 32 hours Self-study hours = 58 hours
Credit points	3.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Engineering thermodynamics; Engineering fluid mechanics; Heat transfer
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand main distributed energy technologies through teaching and practice. Specific objectives include: ● Knowledge: Master the concepts and application fields of distributed energy and cogeneration systems, and the international and domestic background of technology generation and development; master the characteristics of

	users' cogeneration systems and cogeneration systems knowledge of power equipment, waste heat utilization equipment technology, system technology and economic evaluation, and system optimization design; have the ability to analyze the actual operating conditions of the CCHP systems. ● Skills: Students acquire basic theoretical and specialized knowledge about main distributed energy technologies; understand engineering application of main distributed energy technologies; ● Competences:be able to analyze and solve all kinds of main distributed energy systems.
Content	1. Theoretical teaching (32 contact hours; 58 self-study hours) Chapter 1 Introduction (2 contact hours; 8 self-study hours) • The concept and characteristics of the distributed energy and CCHP system. • Development status of distributed energy systems at home and abroad. • Research hotspots and development trends of distributed energy systems. Chapter 2 Energy efficiency of air-conditioning system (5 contact hours; 8 self-study hours) • Process route and basic configuration of the CCHP system. • Prime mover. • Waste heat recovery. • Energy storage. Chapter 3 Design of the CCHP system (5 contact hours; 10 self-study hours) • Load calculation • Selection and design of prime mover • Principles of system equipment configuration • System scheme design • Location and conditions of energy station Chapter 4 Electrical system and electricity grid-connected for the CCHP system (5 contact hours; 8 self-study hours) • Generator operation mode • Power grid connection technology • Power grid connection process • Electrical equipment Chapter 5 Control Technology of Cogeneration System (5 contact hours; 8 self-study hours) • Operation control strategy of the CCHP system

	• Composition of the control system of the cogeneration system • Control system design of the CCHP system Chapter 6 Evaluation of the CCHP System (5 contact hours; 8 self-study hours) • Evaluation of Energy Utilization in Cogeneration System • Technical and economic evaluation of the CCHP system • Environmental evaluation of the CCHP system • Reliability evaluation of the CCHP system • omprehensive evaluation of the CCHP system Chapter 7 Business Model of the CCHP System (5 contact hours; 8 self-study hours) • Typical business model of the CCHP system • Commercial operation of the CCHP project • Factors Affecting the Development of Distributed Energy and Cogeneration Systems.
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); final exam (80%). Usual performance includes: homework, mid-term results.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] LIN shiping. Application Manual for Distributed Energy Technology, Beijing, China Electric Power Press, 2014. 2. Reference books [1] FU lin,LI hui . Gas combined cooling, heat and power Technology and Applications. Beijing: China Architecture& Building Press,2008 [2] KONG xiangqiang. Combined Cooling Heating and Power. Beijing: National Defense Industry Press,2011. 3. Other materials [1] PPT courseware (self-compiled)

Module designation	professional courses
Module level, if applicable	
Code, if applicable	2101138
Subtitle, if applicable	
Courses, if applicable	Heatingnetwork technology
Semester(s) in which the moduleis taught	7th semester
Person responsible forthemodule	Lecturer Jiang Liu
Lecturer	
Language	Chinese
Relation to curriculum	The course is taught to undergraduates majoring in energy and power engineering, which is an elective course for active majors. It is widely used in the engineering and technical fields such as heating and central heating.This course is a professional and practical course from theory to engineering practice, involving many basic concepts and principles.Through classroom explanation, students can have a systematic and comprehensive understanding of central heating engineering, and help students master the relevant basic concepts, basic theories, basic methods and their applications.It can help students master key points and develop the ability of self-study and independent analysis of problems.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: theoretical teaching Contact hours: 16 hours Of which Theoretical teaching: 16 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 45 hours Contact hours = 16 hours Self-study hours = 29 hours
Credit points	1.5
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	This course is based on engineering thermodynamics, heat transfer, fluid mechanics, pumps and fans, and material

	mechanics.This course focuses on engineering practice and analysis of heat network related technologies.
Module objectives/intended learning outcomes	Through learning of this course, students master with hot water and steam as heat medium and working principle of the central heating system of heat supply network forms such as basic theory knowledge, and have some basic knowledge of operation management, raises the student system integrated use of basic knowledge, basic specialized knowledge and the ability of professional knowledge, training students more skilled to consult the design manual, design specification, and the ability of all kinds of standards, to promote students' ability to learn new knowledge. ● Knowledge: Have a preliminary grasp of the basic theoretical knowledge of the working principle of the central heating system using hot water and steam as the heat medium and the form of heating network, and have some basic knowledge of operation and management ● Skills: Develop students' ability to systematically use basic knowledge, professional basic knowledge and professional knowledge ● Competences: train students to be more proficient in consulting design manuals, design specifications and various standards to promote students' ability to learn new knowledge
Content	Theoretical teaching (16 contact hours; 29 self-study hours) Chapter 1 The introduction (1 contact hours; 1 self-study hours) • the main research object and content of heating engineering • development of heating technology Chapter 2 Hot water heating system (2 contact hours; 3 self-study hours) • Gravity circulating hot water heating system • Mechanical circulating hot water heating system • Hot water heating system for high-rise buildings Chapter 3 Indoor steam heating system (2 contact hours; 3 self-study hours) • Indoor low-pressure steam heating system • Indoor high-pressure steam heating system • Traps and other accessories Chapter 4 Heat load of central heating system (2 contact hours; 3 self-study hours) • Thermal load estimate • Heat load figure

	• Annual heat consumption calculation Chapter 5 Central heating system (2 contact hours; 3 self-study hours) • Hot water heating system and heat network composition • Steam heating system and heat network composition • heat medium choice Chapter 6 Hydraulic calculation of steam heating system pipe network (2 contact hours; 3 self-study hours) • Hydraulic calculation of steam pipe network • Hydraulic calculation of condensate pipe network Chapter 7 Heat station and main equipment of central heating system (2 contact hours; 3 self-study hours) • Civil heat station • Industrial heat station Chapter 8 Laying and construction of heating pipes (1 contact hours; 1 self-study hours) • Layout and laying of heat supply network • Heating pipes and accessories Chapter 9 Heat source for central heating system (1 contact hours; 1 self-study hours) • Area boiler room • Thermal power plant • Other sources of heat Chapter 10 Technical and economic analysis of heating system (1 contact hours; 2 self-study hours) • Basic overview • The index calculation and evaluation method of economic effect • The economic friction of the heat network • Comparison of technology and economy between thecogeneration andtheseparate generation
Study and examination requirements and forms ofexamination	Final score includes: usual performance (30%); final exam (closed book written examination) (70%). Usual performance includes: assignment and attendance
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Yuzhuo Tian. Heating engineering. Beijing: China machine press, 2008. 2. Reference books [1] He Ping and Sun Gang. Heating engineering (third edition). Beijing: China building industry press, 1993. [2] Heating engineering, edited by WangYuqing, Harbin

	Institute of Technology press, 2001. [3] Zhang Kaiju, Liu Weiliang, Song Wei. Heat network and heating. Beijing: China electric power press, 2008.

Module designation	Professional course
Module level, if applicable	
Code, if applicable	2101146
Subtitle, if applicable	
Courses, if applicable	Energy management and audit
Semester(s) in which the module is taught	Sixth term
Person responsible for the module	Yongwen Yang
Lecturer	NO
Language	Chinese
Relation to curriculum	(1) The first courses in this course are advanced math-e matics and engineering thermodynamics, heat transferand basic management knowledge. (2)This course covers a broad range of technical areas a nd therefore requires only basic concepts for the firstcou rse. Because of the strong application of this cours-e, it pays more attention to practical mastery than theoretical knowledge. At the same time of studying this course, because of the combination of daily views to s-t rengthen thinking and summary. (3) This course is of great significance to the study and research on energy conservation. At the same time, it is also of great significance to the scientific research work in the stage of master's degree, to help studentsun derstand the value of scientific research and to learnto u se the analytical methods of technology and econ-omy.
Type of teaching, contact hours	Target Student: Thermo major, School of Energy and Mechanical Engineering Type of instruction: comprehensive courses Contact time: 32 weeks
Workload	Workload = 90 hours Contact hours = 32 hours Self-study hours = 58 hours
Credit points	2.0
Requirements according to the examination regulations	Under the environment of economic sustainable d-ev elopment, energy management and auditing have be-en i ncreasingly subject to environmental protection, int-ernal constraints and market pressure to reduce the c-ost of pr oducts. This field has generated a large numb-er of new needs related to energy use engineering pr-ojects and e conomic evaluation.

	Curriculum evaluation is mainly supplemented by open-book examination and course assignment. Emphas-is is placed on the assessment of basic concepts, basicprin ciples and basic methods, so that students can ma-ster t he basic knowledge of energy management and audit through the examination; the main content of th-e course assignment is the calculation of energy consu-mpt ion in cases and the analysis of technology and ec-ono my, so that the theory and practice can be combi-ned.
Recommended prerequisites	Advanced Mathematics and Engineering Thermodynamics, Heat Transfer and Basic Management Knowledge
Module objectives/intended learning outcomes	The teaching objectives of energy management and auditing are: This course is a professional course for the trainin-g of undergraduate hot motion major. It is a compreh-en sive course based on the full understanding of energy, management and audit, which is formed by the in-tersect ion and penetration of various technical disciplins,and in volves a wide range of technical fields. From power, en ergy supply equipment, to building energy, to the balance of economics, audit field, across the science, engineering, liberal arts three major categories. The cou rses include energy balance analysis, energy audit, energ y management and audit application analysis, energy sav ing project investment analysis, contract energy managem ent, energy bill and low carbon operation, construction, enterprise energy saving technology and potential analysi s. Close the contents. ● Knowledge: energy balance analysis, energy audit, energy management and audit application analysis, energ y-saving project investment analysis, contract energy man agement, energy billing and low-carbon operations, buildi ng, enterprise energy-saving technology and potential ana lysis, etc. ● Skills: master the energy consumption calculation and technical and economic analysis of the case ● Competences: a combination of energy audit theory and engineering practice
Content	1. Theoretical teaching (32 contact hours; 58 self-study hours) Chapter 1 China's energy situation and energy policy (5 contact hours; 8 self-study hours) • Classification of energy types • Prospect of energy development in China

	• World energy situation and Prospect • Importance of energy saving • Energy saving policies and regulations in China Chapter 2 Basic knowledge of DSM (5 contact hours; 9 self-study hours) • Overview of DSM • Main means of DSM • Power load management technology • Energy efficient power plant • Power demand side management and energy saving Chapter 3 Energy audit (4 contact hours; 8 self-study hours) • Energy audit laws and regulations and related standards • Concept of energy audit • Content of energy audit • Energy audit procedures • Energy audit method Chapter 4 Contract energy management (5 contact hours; 8 self-study hours) • Overview of energy contract management • Types of contract energy management • Contract energy management implementation process • Risks and Countermeasures of energy management contract projects • Contract energy management Financial Fund Award Chapter 5 Measurement and verification of energy saving (5 contact hours; 8 self-study hours) • General principles of energy saving measurement and verification • Energy saving measurement and verification process • Determination and monitoring method of energy saving and its report • Energy efficiency testing instrument Chapter 6 Technology economy analysis and LCA life cycle assessment method (4 contact hours; 8 self-study hours) • Technical and economic analysis method • LCA life cycle assessment method Chapter 7 Energy saving technology commonly used in energy management and audit (5 contact hours; 9 self-study hours) • Energy saving of power supply and distribution system

	• Energy saving of motor system • Energy saving of air conditioning system • Energy saving of heating system • Building energy saving • Energy saving of lighting system • Energy saving of industrial heat • Energy saving in high energy consuming industries
Study and examination requirements and forms of examination	Performance evaluation: closed examination. Published 30%, volume 70%.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Teaching material: [1] Wang Du. 660MW unit simulationoperation rules. H andouts in the hospital. Reference: [1] Enterprise Energy Audit and Energy Saving Technol ogy, ed. Yin Hongchao, Dalian University of Techn ology Press ,2006 [2] Energy Saving and Emission Reduction Series - Prin ciples and Implementation Methods of Energy Audit, South China Normal University, China Society of Environm-ental Sciences Organization, Fang Zhanqia ng, Ren Guan-ping Editor-in-Chief, Chemical Industr y Press, 2008. [3] Energy Engineering Management, ed. Zhou Weiguo, Tongji University Press, 2007. [4] Energy markets: price risk management and trading，Tom James，Oxford University Press USA，2007

Module designation	
Module level, if applicable	
Code, if applicable	2101153
Subtitle, if applicable	
Courses, if applicable	Introduction of Energy Efficiency Technologies
Semester(s) in which the module is taught	6th semester
Person responsible for the module	
Lecturer	Professor REN Hongbo
Language	Chinese
Relation to curriculum	The base of the course is engineering thermodynamics, engineering fluid mechanics and heat transfer. Students are required to grasp the basic principles of Engineering Thermophysics in the above-mentioned basic courses. In addition, they are required to pass the training of production practice.
Type of teaching, contact hours	Targeted students: junior of Energy and Power Engineering program Type of teaching: Multimedia teaching Contact hours: 16 hours
Workload	Workload =45 hours Contact hours =16 hours Self-study hours = 29 hours
Credit points	1.5
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Recommended prerequisites	Engineering thermodynamics; Engineering fluid mechanics; Heat transfer
Module objectives/intended learning outcomes	Module objectives: The task of this course is to enable students to understand main energy efficiency technologies through teaching and practice. Specific objectives include: ● Knowledge: Grasp the energy situation at home and abroad at macro level; understand the meaning of energy efficiency and the current challenges; grasp the principle and method of energy saving technology in boiler, heat pump and CHP; master the energy saving measure and application

	example in energy-intensive industries; grasp the technology and methods of system energy efficiency. Understand the basic principle and common methods of energy storage technology; understand the latest technology status and research direction of energy efficiency and emission reduction at home and abroad. ● Skills: Students acquire basic theoretical and specialized knowledge about main energy efficiency technologies; understand engineering application of main energy efficiency technologies; ● Competences: be able to analyze and solve all kinds of main energy efficiency problems including analysis and improvement of existing energy efficiency methods.
Content	1. Theoretical teaching (16 contact hours; 29 self-study hours) Chapter 1 Introduction (2 contact hours; 4 self-study hours) • Basic concepts of energy • Domestic and foreign energy status • Evaluation method of energy efficiency Chapter 2 Energy efficiency of air-conditioning system (2 contact hours; 4 self-study hours) • Main energy efficiency technologies of air conditioning System • Principle and classification of Heat Pump • Engineering application case of Heat Pump Chapter 3 Energy efficiency of heating system (2 contact hours; 4 self-study hours) • Principle of combined heat and power • Operation mode analysis of combined heat and power • Analysis of heat storage technology Chapter 4 Building energy efficiency (2 contact hours; 4 self-study hours) • Energy utilization Characteristics and energy efficiency direction of Public Buildings • Principle and feasibility of energy efficiency technology for different types of buildings Chapter 5 Energy efficiency of industrial heating (2 contact hours; 4 self-study hours) • Basic principle of waste heat power generation technology • Basic principle of residual pressure generation technology • Principle and Application of Mobile Heating Technology Chapter 6 Energy efficiency of industrial boiler or kiln (2

	contact hours; 4 self-study hours) • Boiler heat balance • Energy efficiency technology and case analysis of Boiler • Energy efficiency technology of Industrial Kiln and Case Analysis Chapter 7 Energy efficiency in energy-intensive industries (2 contact hours; 5 self-study hours) • Energy efficiency technology in high energy-consuming industries such as iron and steel • Main energy efficiency technologies in thermal power plants Mid-term examination and others (2 contact hours)
Study and examination requirements and forms of examination	Final score includes: usual performance (30%); final exam (opened book written examination) (70%). Usual performance includes: assignment and attendance and computer practice.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1]. STATE GRID, Energy efficiency management and energy-saving technologies, Beijing, China Electric Power Press, 2011 2. Reference books [1].HUANG suyi. Introduction of Energy Efficiency. Hubei: Huazhong University of Science and Technology Press,2008 [2]LI chongxiang. Energy efficiency Principle and Technology. Shanxi: Xi'an Jiaotong University Press,2011 3. Other materials [1]. PPT courseware (self-compiled)

Module designation	
Module level, if applicable	
Code, if applicable	2101131
Subtitle, if applicable	
Courses, if applicable	Principles and Equipment of Refrigeration B
Semester(s) in which the module is taught	7th semester
Person responsible for the module	Lecturer WeiQiu
Lecturer	Lecturer RuiDuan
Language	Chinese
Relation to curriculum	Principles and Equipment B of Refrigeration is a practical elective course for energy and power engineering majors. After taking Heat Transfer, Fluid Mechanics and Engineering Thermodynamics and studying heat transfer theories such as firs/second/third law of thermodynamics, entropy, enthalpy, exergy and anergy, students, by taking this course, can master the working principle of steam compression refrigeration and absorption refrigeration，and have corresponding analysis and calculation ability; students can understand the types and structures of various equipment that make up the refrigeration cycle, working process and operation characteristics; students can master the properties of common refrigerants; students can master the layout and process of refrigeration system; students can grasp the application of refrigeration technology theory in air conditioning and refrigeration. The students can have preliminary ability of calculation and design of refrigeration technology engineering for air conditioning. It will lay a solid foundation for the future to be competent for the air conditioning refrigeration technology job. At the same time, it also provides a professional direction for senior students to take part in postgraduate entrance examination.
Type of teaching, contact hours	Targeted students: Senior Students in Energy and Power Engineering Type of teaching: theoretical teaching Contact hours: 32hours Of which Theoretical teaching: 30hours Experimental teaching: 2hours Self-study hours：58 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload= 90 hours Contact hours = 32 hours Self-study hours = 58 hours
Credit points	3.0
Requirements according to the examination	Only students with class attendance rate over 2/3, and having completed this course and related experiments and passed quiz of each chapter are allowed to take final exam.

regulations	
Recommended prerequisites	Engineering Thermodynamics, Heat Transfer, Fluid Mechanics, Pumps and Fans
Module objectives/intended learning outcomes	Module objectives: ● Knowledge: By taking this course, students may learn basic refrigeration cycles including reverse Carnot cycle, Stirling cycle and reverse Brayton cycle and master 6 types of refrigeration modes including compression refrigeration, absorption refrigeration, adsorption type refrigeration, thermoelectric refrigeration, gas vortex refrigeration and gas refrigeration (with vapor compression refrigeration as the main content). The economic efficiency and performance of refrigeration cycle are analyzed from the point of view of thermodynamics. The thermodynamic process of refrigeration cycle is combined with the actual situation, and the application of refrigeration basic principle equipment is familiar. ● Skills: Master thermodynamic process of vapor compression refrigeration cycle; understand the distinction and linkage between actual refrigeration cycle and theoretical refrigeration cycle; Students are able to choose the type of evaporator, condenser, compressor, throttle valve and main auxiliary equipment by calculating. ● Competences: Master working principles of each refrigeration equipment including compressor, evaporator, condenser, throttle device, liquid reservoir, drying/filtering device, gas-liquid separator and oil separator. Students are able to design a set of refrigeration device according to indoor heat load.
Content	Theoretical teaching (32 contact hours; 58 self-study hours) 1、Theoretical teaching Introduction (1 contact hours; 2 self-study hours) Chapter 1 Refrigeration method (4 contact hours; 6 self-study hours) • Generation of Low Temperature;* • Various refrigeration methods;* • Basic Thermodynamic Principles of Refrigeration;** • Heat pump.** Chapter 2 Single-stage vapor compression refrigeration cycle (4 contact hours; 8 self-study hours) • Theoretical Cycle Of single stage vapor compression refrigeration;** • Practical cycle of single-stage vapor compression refrigeration;* • Performance of a Single-stage Vapor Compression Refrigerator;** • Refrigeration Conditions;* • CO_2 transcritical.* Chapter 3 Refrigerant(2 contact hours; 2 self-study hours)

	• Properties of Refrigerants;** • Mixed refrigerant;* • Acceptable ODS alternatives;* • Practical refrigerant;* • The secondary refrigerant.** Chapter 4 Two-stage compression refrigeration and cascade refrigeration cycle (4 contact hours; 6 self-study hours) • Introduction;* • Two stage compression refrigeration cycle and thermal • calculation; * • Analysis of operation characteristics of two stage • compression refrigeration cycle; ** • Cascade refrigeration cycle. * Chapter 5 Solution Thermodynamics Foundation of Absorption Refrigerator(1 contact hours; 2 self-study hours) • Solution composition; * • Phase diagram of two component system of ideal solution; * • Crystallization, absorption and resolution of Solution; * • Enthalpy concentration diagram of two component system. * Chapter 6 Ammonia absorption refrigerator (1contact hours; 2self-study hours) • Properties of ammonia solution; * • Cycle process of single stage ammonia absorption refrigerator; * • Performance comparison between ammonia absorption chiller and steam compression chiller.* Chapter 7 Lithium Bromide Absorption Refrigerator (4 contact hours;8self-study hours) • Properties of Lithium Bromide Aqueous Solution;* • Principle of Lithium Bromide Absorption Refrigerator;** • Dual-effect lithium bromide absorption refrigerator;* • Double-effect direct-fired lithium bromide absorption chiller and water heater;* • Absorption heat pump cycle.** Chapter 8 Thermoelectric refrigeration (1contact hours; 2self-study hours) • Principle and analysis of thermoelectric refrigeration;* • Characteristics and application of thermoelectric refrigeration.* Chapter 9 Heat Exchange Equipment of Refrigerator(4 contact hours; 8 self-study hours) • Evaporator;** • Condenser;** • Cooling Water System in Water-cooled Condenser;* • Other Heat Exchangers in Refrigeration Units;*

	• Enhanced Heat Transfer Elements.* Chapter 10 Other Auxiliary Equipment and Pipeline of Refrigerator(2 contact hours; 4self-study hours) • Expansion mechanism and valve;** • Auxiliary Equipment and Pipeline of Vapor compression Refrigerator.* Chapter 11 Small refrigeration unit(2 contact hours; 6 self-study hours) • Small refrigeration and freezing device;* • Air conditioner and dehumidifier;* • Display case.* 2. Experiment / practice teaching (2 experiment hours; 2 self-study hours) Experimental name: Experimental curve of compressor performance characteristics. Get familiar with the working procedure of refrigeration system on the basis of refrigeration device experiment. Master working principles of compressor, condenser, evaporator and throttle. Be able to distinguish the working sate of evaporator and condenser. Understand the impact of evaporating temperature or condensing temperature on system. Finally draw the working characteristic curve of compressor.
Study and examination requirements and forms of examination	Final score includes: usual performance (10%); experiment (10%), final exam (closed book written examination) (80%). Usual performance includes: assignment and attendance; Experiment score includes: experiment process; experiment report.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Editor in chief : Wu YeZheng. Refrigeration Principle and Equipment. Xi'an: Xi'an Jiaotong University Press,2017.6. 2. Reference books [1] Wang RuZhu et al. Refrigeration Principle and Technology. BeiJin: Science Press, 2003.8. [2] Yue XiaoFang Chen RuDong. Refrigeration Technology and Application. ShangHai: Tongji University Press, 2006.2. [3] Editor in chief : Yan QiSen. Refrigeration technology for air conditioning. Beijing: China Construction Industry Publishing House, 2010.7. 3. Experiment practice instruction books [1] Self-compiled teaching materials. 4. Other materials [1] PPT courseware (self-compiled).

Module designation	Engineering Fundamentals
Module level, if applicable	
Code, if applicable	8200011
Subtitle, if applicable	
Courses, if applicable	Engineering Training
Semester(s) in which the moduleis taught	3th semester
Person responsible forthemodule	Engineer FENG Qiaobo
Lecturer	Lecturer JIN Yiming EngineerTANG Min Assistant Engineer SONG Lifei Assistant Engineer WANG Chenchen
Language	Chinese
Relation to curriculum	Engineering Training is one of the main practice courses for undergraduates of Energy and Power Engineering program. It combines the basic technological knowledge, methods and practice of manufacturing process. It is a prescribed course for students to understand the process of machining production, cultivate practical ability and engineering quality.Based on engineering practice, the course introduces some basic manufacturing processsuch as turning, milling, casting, welding, fitting, measuring, EDM wire cutting, numerical control turning, laser processing and rapid prototyping.It lays a foundation for students to master and understand mechanical manufacturing technology and product design methods, understand the application of mechanical manufacturing technology in engineering, design, operation and control of related products and equipment, and establish the awareness of safe operation of equipment.
Type of teaching, contact hours	Targeted students: sophomore of Energy and Power Engineering program Type of teaching: theoretical teaching, computer teaching, practice teaching. Contact hours: 40 hours Of which Theoretical teaching: 8 hours Experiment / practice teaching: 32 hours Size of class: No more than 20 people for practice teaching
Workload	Workload= 60 hours Contact hours = 40 hours Self-study hours = 20 hours

Credit points	2.0
Requirements according to the examination regulations	Only students having completed required teaching experiments are allowed to take the exam.
Recommended prerequisites	Safety Education
Module objectives/intendedlearning outcomes	Module objectives: The task of this course is to enable students to Understand the general process of mechanical manufacturing in industrial production through teaching and practice. Specific objectives include: ● Knowledge: Master basic knowledge and theories ofmechanical manufacturing technology; Understand the basic process knowledge of machinery manufacturing and the application of some new processes and technologies in machinery manufacturing, and understand the whole process of industrial product manufacturing. ● Skills: Students acquire basic operation skills to understand the common processing methods of mechanical parts, the working principle of the main equipment used, the use of clamp and measuring tools and safe operation skills, the methods of manufacturing the specified parts. ● Competences: Students acquire abilities to analyze and solve problems and teamwork, practical abilities and innovative thinking on manufacturing engineering technology knowledge.
Content	Practice teaching (40 contact hours; 20 self-study hours) Part 1 Turning practice (4 contact hours; 2 self-study hours) Part 2 Milling practice (4 contact hours; 2 self-study hours) Part 3 Fitting practice (4 contact hours; 2 self-study hours) Part 4 Casting practice (4 contact hours; 2 self-study hours) Part 5 Welding practice (4 contact hours; 2self-study hours) Part 6 Measuring practice (4 contact hours; 2 self-study hours) Part 7 EDM wire cutting practice (4 contact hours; 2 self-studyhours) Part 8 Numerical control turning practice (4 contact hours; 2

	self-study hours) Part 9 Laser processing practice (4 contact hours; 2 self-study hours) Part 10 3D printing practice (4 contact hours; 2 self-study hours)
Study and examination requirements and forms ofexamination	Final score includes: practice score (including usual performance) (80%); Practical Knowledge Test (examinationon computer) (20%). Usual performance includes: assignment and attendance and experiment report
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] ZHU Jianjun. Basic Practice Course of Manufacturing Technology. Beijing: China Machine Press, 2012 2. Reference books [1] HU Dachao, et al. Mechanical Manufacturing Engineering Training. Shanghai: Shanghai Scientific and Technical Publishers, 2004 [2] JULuyue. Fundamentals of Mechanical Manufacturing. Shanghai: Shanghai Jiao Tong University Press, 2008 3. Practice instruction books [1] Self-compiled teaching materials

Module designation	
Module level, if applicable	
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Curriculum Design on Fundamentals of Mechanical Design
Semester(s) in which the module is taught	3th semester
Person responsible for the module	Associate professor MA Xingchi
Lecturer	Professor JI Dongmei Professor CHEN Naichao Associate professor WU Maoliang Associate professor WANG Daolei Associate professor LIU Jianfeng Associate professor HAN Qingpeng Associate professor WU Binghui Lecturer CAO Lan Lecturer YANG Feng Lecturer YUAN Binxia Lecturer LI Min Lecturer DONG Xinfeng Lecturer QIN Dezhao Lecturer WANG Fei Lecturer LIU Yinghui Lecturer WANG Huageng
Language	Chinese
Relation to curriculum	This course is a practical part after the theoretical teaching of " Fundamentals of Mechanical Design ".
Type of teaching, contact hours	Targeted students: Sophomore of Energy and Power Engineering Practice teaching: 40 hours Size of class: No more than 20 people for practice teaching
Workload	Workload= 120 hours Contact hours = 40 hours Self-study hours = 80 hours
Credit points	4.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, and having completed required assembly drawing, part drawing and design specification are allowed to participate in the oral defense.
Recommended	Fundamentals of Mechanical Design

prerequisites	
Module objectives/intended learning outcomes	This course is an important and comprehensive teaching part for students after theoretical study of the course "Fundamentals of Mechanical Design". The purpose of this course is to further consolidate and deepen the theoretical knowledge learned, and to analyze and solve the mechanical design problems by comprehensively using the mechanical design course and other knowledge about the theory and production practice of the previous courses, so that students have a complete concept of the overall design of mechanical devices and the structural design of mechanical parts. Specific objectives include: ● Knowledge:Students can formulate and analyze the design scheme according to the functional requirements and principles of the machine, and reasonably select motors, transmission mechanisms and parts. ● Skills:Students can analyze and calculate the load on the parts according to the working conditions of the machine, reasonably select the materials of the parts, correctly calculate the working capacity of the parts and determine the main parameters and sizes of the parts. Students can consider manufacturing process, installation and adjustment, use and maintenance, economy and safety and other issues to carry out structural design of machines and parts. ● Competences:Students can draw assembly drawings and part drawings of machines and components. The drawings conform to drawing standards, the dimensions and tolerances are marked correctly, and the technical requirements are complete and reasonable. Students can write design specification and other relevant technical documents.
Content	The content of the course should include the design calculation and structural design of the transmission device: 1. Design preparation (4 contact hours; 8 self-study hours) • Read the design task book and specify the design requirements, working conditions, contents and steps; Understand the design object by assembling and disassembling the reducer. Clarify the methods and steps of curriculum design, and draw up the design plan. 2. Design of transmission device (4 contact hours; 8 self-study hours) • According to the parameters and work requirements, analyze and select the scheme of the transmission device; Calculating power and selecting a motor; Determining a total

	transmission ratio and distributing transmission ratios of all levels; Calculating the rotating speed, torque and power of each shaft; Draw a schematic diagram of the transmission scheme. 3. Design and calculation of transmission parts (8 contact hours; 16 self-study hours) • Through design and calculation, the main parameters and dimensions of each transmission part are determined, generally including belt transmission, coupling, gear transmission, etc. 4. Structure design and reducer assembly drawing (8 contact hours; 16 self-study hours) • Analyze and select the structural scheme of the reducer, draw the shafting structure and its related parts. Check the strength of shafts, keys and couplings and the service life of rolling bearings. For structural design of shafting, box body and its accessories, box body accessories shall generally include peep window, oil mark, oil drain hole and its screw plug, lifting device, etc. Mark the necessary dimensions and tolerance fit, write the reducer characteristics, technical requirements and part serial number, and write the parts list and title bar. 5. Parts drawings (8 contact hours; 16 self-study hours) • You can select shafts or gears; Dimensions and tolerances shall be marked and technical requirements shall be complete, and the working drawing of gear parts shall have gear tolerance table. 6. Complete the reducer assembly drawing. (4 contact hours; 8 self-study hours) 7. Organize and compile design specifications. (4 contact hours; 8 self-study hours)
Study and examination requirements and forms of examination	Final score includes: usual performance (20%); oral defense (80%). Teachers give comprehensive results according to students' design ability, design quality and oral defense.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks, Drawing tools.
Reading list	1. Required books [1] WU Zongze, LUO Shengguo. Handbook of Mechanical Design Course Design (4th Edition). Beijing: Higher Education Press, 2012 2. Reference books [1] CHEN Xiaonan. Fundamentals of Mechanical Design (2nd Edition). Beijing: Science Press, 2012.

	[2] PU Lianggui, CHEN Guoding. Mechanical Design (9th Edition). Beijing: Higher Education Press, 2013.

Module designation	Practical Training
Module level, if applicable	
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	Internship
Semester(s) in which the moduleis taught	8th semester
Person responsible forthemodule	
Lecturer	All teaching staff of this program
Language	Chinese
Relation to curriculum	Internship is a preparatory stage before Bachelor Thesis which is designed to allow students to integrate theoretical knowledge with practical work, acquire deep understanding of the fields the specialty serve and understand the production process and technology of the field. On the basis of internship and requirements/content of topic of Bachelor Thesis, students may conduct technical material search and research and thus prepare for Bachelor Thesis.
Type of teaching, contact hours	Targeted students: seniors of Energy and Power Engineering program Type of teaching: practice Contact hours: 10 weeks Theoretical teaching and experiment/practice teaching are arranged by instructors and enterprise technical personnel on the basis of each students specific internship Size of class: each instructor teaches 15-30 students
Workload	Workload=240 hours
Credit points	8
Requirements according to the examination regulations	During internship, students shall follow all rules concerning practice, labor administration and safety of the enterprise. Students shall complete all tasks carefully, listen attentively to instructions of teachers, enterprise technical personnel and employers, and keep intern notes.
Recommended prerequisites	Complete all theoretical courses

Module objectives/intended learning outcomes	Module objectives: As an important part of practice teaching of the specialty, internship is a preparatory stage before Bachelor. The object and task of internship is enabling students to integrate theoretical knowledge with practical work, acquire deep understanding of the fields the specialty serve and understand the production process and technology of the field. • Knowledge: Through Internship, students may acquire deeper understanding of the specialty and the scope as well as significance of application of knowledge in practical work. • Skills: After internship, students may further understand product design method, production process, equipment process technology and principles/performance/parameters of major production equipment. Through site observation, understand production and technology of related fields so as to increase knowledge and develop Competences. • Competences: Students may have a deeper impression of the enterprise associated with the specialty and deeper understanding of the relationship between enterprise production environment and other industry enterprise. During internship, students may receive social and specialty skills training integrating internship with social practice and thus lay a foundation for adaptation to different kinds of working environment and enterprise culture in the future. All these will help develop students' ability in future work and social practice.
Content	1. Internship (8 weeks) Arranged by the School, students go to production/manufacturing enterprise and equipment application enterprise for internship practice in the form of visit, on-site work and study and attending technical lectures etc. (1) Give safety instructions. Learn about all kinds of production measures and rules of selected plant so as to guarantee safety, acquire production safety knowledge and develop relevant awareness*(3 days); (2) Learn about process, main equipment (structure, performance, configuration parameter and working principles), plant layout and operation requirements/skills of each post**(2 weeks); (3) Get familiar with the basic characteristics of the production and production process of enterprise; get familiar with the basic principles and methods of and product **(2 weeks); (4) Analyze process principles of energy & power production process engineering with acquired theoretical knowledge, especially the methods and measures involved in achieving overall production objectives such as high-production, high-quality, low consumption and low pollution** (1.5 weeks) (5) Understand the operation methods of all production process

	through video teaching, lecture, seminar and on-site visit; learn about technical parameter, performance, technical level and current situation of product ** (1.5 weeks) (6) Complete internship report independently according to the specific situation of the enterprise; prepare a topic for oral defense and report independently * (4 days) production process; understand design method of system
Study and examination requirements and forms ofexamination	During internship, instructors shall ask students to prepare internship report and organize exam (oral exam). Evaluation of internship is based on students performance (compliance with rules and evaluation of employees and technical personnel), quality of internship notes and report, students answers to questions and quiz. Score of internship is in hundred-mark system.
Media employed	Multi-media computer, projector, laser pointer etc.
Reading list	1. Required books [1] Instructors recommend books to students according to specific academic needs 2. Other materials [2] PPT courseware (self-compiled) used by teachers and enterprise technical personnel for explanation to students.

Module designation	Compulsory Course（Practice）
Module level, if applicable	
Code, if applicable	2101209
Subtitle, if applicable	
Courses, if applicable	Course Design of Principles of Boilers (Steam Turbines) (2)
Semester(s) in which the moduleis taught	6th semester
Person responsible forthemodule	Associate Professor Fangqin Li
Lecturer	Professor Jiang Wu Associate professor Honglei Ding Associate professor Yan Li Associate professor Zhihai Cheng Lecturer Chengyao Wang Lecturer Qingwei Li Lecturer Zhenzhen Guan
Language	Chinese
Relation to curriculum	This course is the concrete application and practice of the courses of Boiler Principle and Heat Transfer. It is the comprehensive application of these courses of energy and power engineering specialty.This course is an important practical link to summarize, consolidate and improve the theoretical knowledge gained in the course of Boiler Principle. Through calculating the boiler thermodynamics and determining the overall arrangement of the boiler, students can make full and comprehensive use of the boiler principle knowledge they have learned. In this way, not only can the knowledge acquired by the students in the course of Boiler Principle be consolidated, enriched and improved, but also the students can get a basic training in engineer's work, and cultivate the ability of independent work and self-study.
Type of teaching, contact hours	Targeted students: junior students majoring in energy and power engineering Type of teaching: theoretical teaching, counseling and answering questions Contact hours: 40

	Of which Theoretical teaching: 40 hours
Workload	Workload= 240 hours Contact hours = 40 hours Self-study hours = 200 hours
Credit points	8.0
Requirements according to the examination regulations	Attendance rate exceeds 9/10; Master the layout characteristics of the heating surface of the boiler; Master the thermal calculation method of the boiler; Draw the boiler layout drawing; Require the boiler thermal calculation book to be written; Complete the design and the design drawings; Participate in the oral test.
Recommended prerequisites	Boiler Principle, Heat Transfer
Module objectives/intended learning outcomes	Students who have successfully completed the course should reach the following level: • Understanding and determining the overall layout of the boiler; • Mastering the thermal calculation method of the boiler; • Drawing boiler steam water system and combustion system diagram; • Writing the design instruction of the course. • Knowledge: Boiler thermodynamic calculation; hydrodynamic calculation, wall temperature calculation, calculation of smoke wind resistance, boiler design method, modern boiler technical topics. By taking this course, students may have a deep understanding of heat transfer characteristics of all kinds of heating surface, natural cycle, forced cycle and hydrodynamic characteristics of concurrent boiler. • Skills: Master thermodynamic and hydrodynamic calculation methods for boiler design and arrangement; introduce four representative modern boiler technical topics so as to broaden students' horizon. • Competences: Students may have a better understanding of the working characteristics and design of boiler which will lay a foundation for future study and work.
Content	1. Introduction of design objects, boiler characteristics, heating surface layout, combustion equipment, pulverizing system, water supply system, fuel characteristics, etc. (4 Contact hours, 20 self-study hours)

	2. Determine the calculation method and parameters of boiler design (4 class hours in class, 20 class hours in self-study) 3. Calculation of flue gas characteristic table, flue gas temperature enthalpy table and boiler heat balance calculation (4 Contact hours, 20 self-study hours) 4. Furnace structure calculation and thermal calculation (4 class hours in class, 20 class hours for self-study) 5. Structure calculation and thermal calculation of screen superheater (8 Contact hours, 40 self-study hours) 6. Structure calculation and thermal calculation of convection superheater (8 Contact hours, 40 self-study hours) 7. Preparation of boiler design instructions (4 Contact hours, 20 self-study hours) 8. Draw the flow chart of boiler steam water system (4 Contact hours, 20 self-study hours)
Study and examination requirements and forms ofexamination	According to three aspects of the situation, the comprehensive assessment (each accounting for one third of the proportion): (1) Usual performance in the design process (including learning discipline, self-learning ability, data access ability, analytical ability, computing ability and drawing ability, etc.); (2) Design quality; (3) defense.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] Quangui Fan. Boiler Principle, China Electric Power Publishing House, 2006 2. Reference books [1] Luanen Rong. Principle of Power Plant Boiler, China Electric Power Press, 2008 2. 3. Other materials [1]. PPT courseware (self-compiled)

Module designation	Practice
Module level, if applicable	
Code, if applicable	2101210
Subtitle, if applicable	
Courses, if applicable	Course Design of Principles of Boilers (Steam Turbines) (2)
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Processor HU Danmei Associate processor HE Ping Processor GUO Ruitang Professor ZENG Zhuoxiong Lecturer YING Yulong
Lecturer	Processor HU Danmei Associate processor HE Ping Processor GUO Ruitang Professor ZENG Zhuoxiong Lecturer YING Yulong
Language	Chinese
Relation to curriculum	This course is the concrete application and practice of the courses of Steam Turbine principle and Engineering Thermodynamics. It is the comprehensive application of these courses of energy and power engineering specialty. This course is an important practical link to summarize, consolidate and improve the theoretical knowledge gained in the course of Steam Turbine principle. Through the comprehensive application of the learned knowledge, the thermodynamic calculation and structure design of steam turbine, student can get a more comprehensive and systematic training of independent working ability.
Type of teaching, contact hours	Theoretical lecture, design progress report

Workload	Workload= 240 hours Contact hours = 40 hours Self-study hours = 200 hours
Credit points	8.0
Requirements according to the examination regulations	Only students with class attendance rate over 9/10, assignment completion rate over 9/10 are allowed to take the design defense.
Recommended prerequisites	Steam Turbine Principle；Engineering Thermodynamics.
Module objectives/intended learning outcomes	Module objectives: Through the overall design of the steam turbine, in particular the detailed thermodynamic calculation and structural design calculation, student can fully and comprehensively use the theoretical knowledge of the steam turbine, and understand the overall structure and working characteristics of the steam turbine. Specific objectives include: ● Knowledge: student can consolidate and deepen the theoretical knowledge learned in the course of steam turbine, and master the principles, methods and steps of thermodynamic calculation of steam turbine. Through the course, they can understand the overall structure of the steam turbine, and the function, position and relationship of the main parts on the unit. ● Skills: student can get ability training in a reference to the literature, the application of design materials and manuals, comprehensive analysis, design and calculation, drawing, data processing. ● Competences: student can cultivate rigorous scientific attitude, serious and responsible, meticulous work spirit.
Content	1. The simplified thermal calculation and the thermodynamic process drawing of the control stage. (3 Contact hours and 10 self-study hours) 2. The determination of the pressure stage number, the distribution of the pressure drop at the pressure stage. (4

	Contact hours and 10 self-study hours) 3. The detailed thermodynamic calculation and the structural design calculation of the first pressure stage. (10 Contact hours and 30 self-study hours) 4. The thermodynamic calculation list and the structural design calculation of other pressure stages. (5 Contact hours and 50 self-study hours) 5. The internal power of the whole machine, the relative internal efficiency checking and calculating of the whole machine . (5 Contact hours and 10 self-study hours) 6. Drawing the whole machine thermodynamics line, pressure grade speed triangle. (5 Contact hours and 20 self-study hours) 7. Drawing the longitudinal section of the turbine through-flow section. (5 Contact hours and 20 self-study hours) 8. Writing the turbine course design specification. (3 Contact hours and 50 self-study hours)
Study and examination requirements and forms of examination	Usual performance（20%）, design quality（60%） and defense （20%）
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Required books Jin Zhiping, Principle and System of Steam Turbine in Power Plant. Beijing: China Electric Power Press, 2006.

Module designation	
Module level, if applicable	
Code, if applicable	2101144
Subtitle, if applicable	
Courses, if applicable	Designing Project for Thermal Power Plants
Semester(s) in which the module is taught	8th semester
Person responsible for the module	Associate Professor ZHENG Puyan
Lecturer	Associate processor WANG Du Associate processor MA Xinxia Lecturer LU Jianfeng Lecturer LIU Xiaojing Lecturer YAN Ting
Language	Chinese
Relation to curriculum	The course design of thermal power plant is one of the main courses for undergraduates majoring in energy and power engineering. It is a comprehensive application of basic courses and professional knowledge of thermal engineering. It combines boilers, steam turbines, feed pumps and other equipment into a thermal system. Through the course design, students can master the methods of energy balance and comprehensive analysis of thermal system in electric power enterprises. Based on the engineering practice, the course introduces how to draw up the thermal system of power plant, how to determine the connection mode of the system and how to select the main related equipment. It expounds the methods and steps of energy balance calculation of the principled thermal system of power plant and explains how to calculate and analyze the thermal economy of various systems by using heat method. The drawing method of energy flow diagram is involved. The composition of comprehensive thermodynamic system and how to draw partial comprehensive thermodynamic system diagram of power plant are introduced.
Type of teaching, contact hours	Targeted students: senior of Energy and Power Engineering Type of teaching: theoretical teaching Contact hours: 40 hours Size of class: No more than 60 people for theoretical teaching
Workload	Workload=240 hours Contact hours = 40 hours

	Self-study hours = 200 hours
Credit points	8.0
Requirements according to the examination regulations	Only students with class attendance rate over 2/3, assignment completion rate over 2/3, are allowed to take the exam.
Recommended prerequisites	Thermal power plant; Engineering thermodynamics; Heat transfer; Hydrodynamics; Boiler principle; Steam turbine principle; Pump and fan
Module objectives/intended learning outcomes	The course design is the concrete application and practice of the course "Thermal Power Plant". It is a comprehensive application of the basic courses and professional knowledge for thermal energy engineering specialty. It focuses on the application of theoretical knowledge to a specific power plant production system. Specific objectives include: ● Knowledge: Understand the process of formulating the principal thermal system of a power plant. Understand the calculation method of energy balance and the calculation and analysis of thermal economy index of the actual thermodynamic system. Understand the composition of the comprehensive thermal system of the power plant. ● Skills: Able to carry out the program of the power plant thermal system, and to select the pipe, equipment and system connection. Master the calculation of system energy balance and the general calculation method of principle thermodynamic system in power plant. Apply the basic theory and method of thermal economy analysis to calculate and analyze the thermal economy of various thermal systems. ● Competences: Through the study of curriculum design of thermal power plant, students' ability to analyze practical engineering problems with professional knowledge is cultivated.
Content	The main contents of this course design are as follows: 1. The formulation of a principled thermodynamic system (10 contact hours; 40 self-study hours): According to the given conditions, the principled thermal system of the power plant is formulated and plotted (A2) . 2. The calculation of principled thermodynamic system (10 contact hours; 60 self-study hours): Calorific method is used to calculate the thermal system, and the steam and water flow quantity, power generation and

	main thermal economic Indicators in all parts are obtained. 3. Thermal economic analysis of the system (10contact hours; 60 self-study hours): Draw energy flow chart (A2) of power plant and steam expansion process line (A3) of steam turbine and analyze them. 4. Development of a comprehensive thermodynamic system (10 contact hours; 40 self-study hours): Determine the main parts of a comprehensive thermodynamic system, and be able to point out the main equipment and systems on a comprehensive thermodynamic system diagram. Understand the function of the equipment. Draw the local comprehensive thermodynamic system diagram (A2).
Study and examination requirements and forms of examination	Final score includes: final course reply (50%); Design product (30%); usual performance (20%). Usual performance includes: assignment and attendance.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	1. Required books [1] ZHENG Puyan, WANG Du, LU Jianfeng. Course Design Taskbook of Thermal Power Plant. 2. Reference books [1] ZHENG Tikuan. Thermal Power Plant. Beijing: China Electric Power Publishing Press, 2001 [2] WU Xuesu, GAO Nanlie. Exercises for Thermal Power Plants. Beijing: Water&Power Press, 1994 [3] SHEN Weidao. Engineering Thermodynamics. Beijing: Higher Education Press, 2004 [4] JIAN Tiancong. Turbine Principle. Beijing: China Electric Power Press, 1992

Module designation	
Module level, if applicable	
Code, if applicable	2101029
Subtitle, if applicable	
Courses, if applicable	Simulation practice
Semester(s) in which the module is taught	8th semester
Person responsible for the module	Wang Du
Lecturer	Lu Jianfeng, He Ping, Ma Xinxia, Liu Xiaojing, Yan Ting
Language	Chinese
Relation to curriculum	Based on the perceptual knowledge of power plant equipment and system, the simulation practice is carried out after the completion of all professional courses of this major. It is a practical link aiming at cultivating and improving students' comprehensive application knowledge and practical operation skills. It is an important practical teaching link of energy and power engineering major. It integrates all professional course theoretical knowledge and will be applied in a specific way Best platform
Type of teaching, contact hours	Targeted students: seniors of Energy and Power Engineering program Type of teaching: practice Contact hours: 4 weeks practice teaching
Workload	Workload= 240 hours Contact hours = 120 hours Self-study hours = 120 hours
Credit points	8.0
Requirements according to the examination regulations	This practice is to arrange the students to carry out the simulation operation practice of ultra supercritical 660MW Unit on the computer of the school power simulation center. Through practice, students should understand the operation mode of each system process and main equipment of the power plant and relevant technical and economic indicators, and be familiar with the structure and performance of thermal equipment. The specific requirements for students in this internship are to understand the specific methods of starting operation of 660MW Unit and various problems that should be paid attention to in the actual operation through the actual operation on the computer; to understand the start-up,

	shutdown procedures, normal supervision and regulation of main equipment of the unit; to understand the analysis, judgment and treatment methods of common accidents in the operation of the unit.
Recommended prerequisites	Complete all theoretical courses
Module objectives/intended learning outcomes	Module objectives: understand the operation mode of each system process and main equipment of the power plant and relevant technical and economic indicators, and be familiar with the structure and performance of thermal equipment. ● Knowledge: in terms of knowledge, preliminarily learn and master the start-up and stop operation steps of the unit under various working conditions and the regulation and monitoring technology of normal operation, and be familiar with the knowledge of centralized control operation of the unit system unit. Through the simulation practice, the students are familiar with the operation mode and relevant technical parameters of each system and main thermal equipment of the thermal power plant. Through the practice of simulation room, the knowledge of all professional courses is organically linked, and the establishment of power plant unit is an overall concept. ● Skills:in the aspect of skills training, we should combine theoretical knowledge with practical operation, guide practical operation with theory, deepen the understanding of theory with practical operation, consolidate and expand students' professional knowledge. The specific requirements for the students are to understand the specific methods of starting and operation of 660MW Unit and various problems that should be paid attention to in the actual operation through the actual operation on the computer; to understand the start-up and shutdown procedures of main equipment of the unit and the normal supervision and regulation; to understand the analysis and judgment methods and handling methods of common accidents in the operation of the unit. ● Competences: in the aspect of ability training, this practice is to simulate the real operating system of 660 MW unit central control room in thermal power plant, and carry out soft simulation operation on the computer. Through the simulation practice, students can realize the operation of the whole unit on the computer, cultivate and exercise the practical ability, connect the professional knowledge learned before with the actual equipment, and improve the

	adaptability of students to the future work.
Content	1. 660MW Unit introduction, simulation software introduction, operation screen function introduction, start-up program introduction. (10 Contact hours and 10 self-study hours) 2. Put the utility system into operation. It mainly includes the operation of condensate make-up water system, closed cooling water system, compressed air system, circulating water injection system, circulating water and auxiliary steam system. (10 Contact hours and 10 self-study hours) 3. Put the auxiliary system on the side of the machine into operation. It mainly includes the operation of main engine lubricating oil system, EH oil system, sealing oil system, hydrogen filling of generator, pre operation inspection of high and low pressure heaters, operation of condensate system, deaerator flushing and water filling, operation of shaft seal and vacuum pumping, operation of small oil system and shaft seal system, deaerator heating water supply, operation of electric water pump. (15 Contact hours and 15 self-study hours) 4. Preparation for boiler ignition. It mainly includes inspection before putting into operation of boiler start-up system, water injection, air release and cleaning of BCP pump and motor, boiler water supply and Superheater cleaning, fire detection cooling air system, air and smoke system, fuel oil system before putting into operation, preparation before putting into operation of micro oil system, preparation before putting into operation of pulverizing system, oil system of high and low pressure bypass, inspection before putting into operation of soot blowing system, generator and The excitation system is changed to cold standby. (15Contact hours and 15 self-study hours) 5. Boiler ignition, temperature rise and pressure rise. It mainly includes oil leakage test, furnace purging, furnace flue gas temperature probe, HP and LP Bypass, oil gun ignition or micro oil ignition, boiler hot cleaning, boiler temperature rise and pressure rise, HP and LP Bypass Control System will gradually open the valve position according to the increase of fuel quantity, boiler steam parameters will rise to meet the parameters of turbine impulse, boiler ignition and temperature rise and pressure rise In the process of bypass system control, the generator and excitation system are changed to hot standby. (20 Contact hours and 20 self-study

	hours) 6. Steam turbine generator unit impulse starting, grid connection and initial load connection. Confirm the conditions for impulse starting of steam turbine and the allowable conditions for SGC program-controlled start of steam turbine. After impulse starting, warm up the steam turbine at low speed, increase the speed of steam turbine to more than 1500r / min, start the sequence control sub groups of No. 5 and No. 6 low pressure heaters, warm up the steam turbine at full speed, connect to the grid and quickly connect with 5% initial load. (10 Contact hours and 10 self-study hours) 7. The unit load is increased to 200MW. Set the unit load as 200MW, load rise rate as 5MW / min, load greater than 50MW, start the sequence control sub group of high pressure heater, when the load rises to 150MW, combine it with the first steam pump, when the load rises to 150mw-180mw, switch the bypass valve of main water supply to the electric valve of main water supply, check and prepare the second small turbine for impulse starting and standby, switch the steam source of deaerator when the fourth extraction pressure is greater than 0.2MPa, with the load rising high The low-pressure bypass automatically turns down until it is fully closed. The high-pressure bypass enters the sliding pressure control mode. After the load rises to more than 180MW, the auxiliary power switching operation is carried out. (15Contact hours and 15 self-study hours) 8. The load of the unit is increased to 330MW. When the fuel quantity of the boiler is increased to 35% BMCR, the wet state of the boiler will be turned into dry state operation, BCP pump will be stopped, mill D will be started, fuel quantity will be increased to 40% BMCR to confirm that the operation condition of the pulverizer is stable, the oil gun and micro oil system will be gradually exited, the steam source of the small unit will be switched to four extraction steam supply, 240mw, and the second steam feed pump will be incorporated to stop the electric feed pump. (15Contact hours and 15 self-study hours) 9. The unit load is increased to 660MW. After 50% BMCR, e pulverizing system was started, and stable parameters gradually increased to full load. (10 Contact hours and 10 self-study hours)
Study and examination	Performance evaluation: there are three bases for evaluation: learning attitude (20%), practice report (10%) and computer

requirements and forms of examination	performance (70%). Internship results are divided into excellent, good, medium, pass and fail five.
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Textbook: [1] Wang Du. 660 MW unit simulation operation rules. Lecture notes prepared by the Institute Reference books: [1] Niu Weidong. Unit operation. Beijing: China Electric Power Press, 2013 [2] Yu Guoqiang. Unit operation. Beijing: China Electric Power Press, 2008

Module designation	Practice
Module level, if applicable	
Code, if applicable	2101202
Subtitle, if applicable	
Courses, if applicable	Graduation Design Project
Semester(s) in which the module is taught	7th, 8th semester
Person responsible for the module	All supervisors
Lecturer	All supervisors
Language	Chinese
Relation to curriculum	Graduation design is an important practical teaching link in this major, which trains students to comprehensively use the basic theory, professional knowledge and basic skills they have learned, to improve their ability to analyze and solve practical problems, and to enable students to obtain the basic training necessary for practical work and the preliminary ability to carry out scientific research work.
Type of teaching, contact hours	Basic theory courses, professional knowledge courses
Workload	Workload= 810 hours Contact hours = 40 hours Self-study hours = 770 hours
Credit points	27.0
Requirements according to the examination regulations	Only students with class attendance rate over 9/10, assignment completion rate over 9/10 are allowed to take the design defense.
Recommended prerequisites	The relative basic theory, professional knowledge.
Module objectives/intended	Module objectives: Through the graduation design project, student can

learning outcomes	integrate and apply basic and professional theoretical knowledge. Specific objectives include: ● Knowledge: student can comprehensively consider and analyze the technique, safety and economic problems in the project. Student can consolidate and deepen the the basic and professional knowledge learned, and students' independent working ability can be developed to analyze and solve engineering and technical problems in their major. ● Skills: student can get practical skills such as innovation; the applications of foreign language and computer; the ability to investigate and study, look up domestic and foreign literature, and collect data; the ability to analyze theoretically and develop test scheme; design, calculation and mapping capacities; experimental research and data processing capacities; the ability to write scientific and technological papers. ● Competences: student can cultivate rigorous scientific attitude and get preliminary training in scientific research methods.
Content	Content includes: 1. Supervisor tells student graduation project objectives, requirements, tasks, and teaches student related theoretical knowledge. Supervisor checks student work process and quality at least 1-2 times a week; (20 Contact hours and 120 self-study hours) 2. Student can finish the tasks according to the quality on time by studying hard; (5 Contact hours and 90 self-study hours) 3. According to the tasks assigned by the supervisor, student finishes the graduation project scheme; (5 Contact hours and 50 self-study hours) 4. Student reads domestic and foreign materials, and completes English translation; (70 self-study hours) 5. Student complete graduation thesis which includes

	concise and fluent text, clear graphics, standard format; (10 Contact hours and 440 self-study hours)
Study and examination requirements and forms of examination	Usual performance（20%）, design quality（40%） and defense （40%）
Media employed	Multimedia computers, projector, laser pointers, blackboard, chalks
Reading list	Required books relative with the graduation design project