BBChina

Master Program
on Bio-Based Circular Economy

General Curriculum

Structure and Syllabus of the Master Program

Version 6 – August 2020

Project reference number - 586083-EPP-1-2017-1-IT-EPPKA2-CBHE-JP

General Curriculum

Master Program on Bio-Based Circular Economy

Document Information

Project title and Acronym:	Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China (**BBChina**)		
Programme:	Erasmus + Key Action 2 Capacity Building in the field of Higher Education		
Project Number:	586339-EPP-1-2017-1-IT-EPPKA2-CBHE-SP		
Start date:	15 October 2017	End date:	14 October 2020
Work Package:	WP02 – MASTER COURSE DEFINITION / **Deliverable 2.3**		
WP Leader	P3 - MDH	WP Co-Lead	P1 - UNIFI
Dissemination level	Institutional level (Department/Faculty, Institution)		

Document History

Version	Date	Submitted by	Reviewed by	Notes
VER1	08/08/2018	MDH; UNIFI	IAB	1st version
VER2	20/10/2018	MDH; UNIFI	Partnership	Feedbacks and Comments provided by IAB included. Updates after PAU2
VER3	30/04/2019	MDH; UNIFI	Partnership	Updates after PMU2; Format: inserted logo and EU disclaimer, minor typo corrections
VER4	11/11/2019	UNIFI	Partnership	The document is implemented with approval steps description to be presented to the EACEA
VER5	22/01/2020	UNIFI	Partnership	Courses and material implementation process table updated with more detailed information; Course contents added
VER6	31/08/2020	UNIFI	Partnership	Updates; added an executive summary

Co-funded by the Erasmus+ Programme of the European Union

Co-funded by the Erasmus+ Programme of the European Union

1 Introduction

The development of the Syllabus of the new Master Program was the starting point for the implementation of the BBChina action. It was defined on the basis both of the results of the Education and Training Needs Assessment (ETNA, Deliverable 2.1) and the existing courses already available within the EU and Chinese Higher Education Institutions (HEIs).

The first version of the Syllabus was submitted to the International Advisory Board (**IAB**) of the Project, in order to get the feedback from its components and, once received, implement them.

The present document is the final version, based on which the Master Program and the Courses under development were sent to each University/College/Institution board for approval and further inclusion in the Educational Offer from Academic Year 2019/2020 on.

In the present document the partners involved in the project are indicated per acronym as in the following: University of Florence (**UNIFI**), Italy, Co-ordinator, University of Rostock (**UROS**), Germany, Mälardalen University (**MDH**), Sweden, Tongji University (**TJU**), China, East China University of Science and Technology (**ECUST**), China, Sichuan University (**SCU**), China, and CESIE (**CESIE**), Italy.

Co-funded by the Erasmus+ Programme of the European Union

2 Executive Summary

The main result of the BBChina project is the establishment of a Master Program on Biobased Economy (Biomass to Energy and Bioproducts) in the involved Chinese Higher Education Institutions (HEIs) **TJU**, **ECUST** and **SCU**.

The Master Program is running since September 2019. The interdisciplinary curriculum involves several independent subject areas including Physical sciences (i.e. Chemistry, Biochemistry, Environmental Sciences, Ecology), Engineering, Agriculture, Forestry, Environmental protection, Market and Economy.

The program is designed to prepare highly-skilled graduates in the biomass to energy and bioproducts chain, who will be able to coordinate the design and implement solutions to solve challenges with respect to technical, economic, environmental, and ecological constraints. Therefore, this master program covers several interdisciplinary topics, such as energy conversion technologies, including different biochemical routes, system design and optimization from both technical and economic perspectives, project management, legal restrictions and aspects of climate change, pollution and the integration of renewable energies.

The structure of the Master Program was implemented to fully comply with the Chinese University structure (2.5 years total duration, where the first year is devoted to front lessons, while last one and half year is devoted to projects and thesis). Indeed, efforts have been done to comply as much as possible with the Bologna Process, in order to also meet the efforts that the 3 Chinese HEIs are

Co-funded by the Erasmus+ Programme of the European Union

actually implementing to adopt a conversion system from Chinese Credits to ECTS.

Furthermore, an Entrepreneurship Course aimed at empowering entrepreneurship attitude in the master students has been developed by the partner **CESIE**, based on their experience in the field (Work Package 8). The program of the entrepreneurship course was fit to the students' target following a “learning needs assessment survey” focussing on the identification of specific students' knowledge/skill gaps in the field of entrepreneurship and soft skills.

The process followed for defining the Syllabus and then to finalise the Program is presented in chapter 4 “Syllabus definition process”.

2.1 Implementation

The BBChina Master Program was implemented as a “Program on Bio-Based Circular Economy” within the already existing Master Degrees at **TJU**, **ECUST** and **SCU**. Depending on the School or College involved, the Degree offered is Master of Science (M.Sc.) or Master of Engineering (M.Eng.).

As a matter of example, at the “College of Environmental Science and Engineering” in Tongji University the Master Program is implemented within the Master Degree (M.Eng.) in “Environmental Engineering”. Therefore, the final degree achieved by the University Student is M.Eng in “Environmental Engineering” on “Bio-Based Circular Economy (BBChina)”.

The Master Program is presently running in the following Institutions:

- **Tongji University (TJU)**:
    - College of Environmental Science and Engineering
    - School of Mechanical Engineering

- **East China University of Science and Technology (ECUST)**:
    - School of Mechanical and Power Engineering
- **Sichuan University, Chengdu (SCU)**:
    - College of Life Sciences
    - College of Chemical Engineering and Technology
    - College of Chemistry
    - Institution of New Energy and Low-Carbon Technologies

2.2 Objectives and Learning Outcomes

The program is designed to prepare highly-skilled graduates in the biomass to energy and bioproducts chain, who will be able to coordinate the design and implement solutions to solve challenges with respect to technical, economic, environmental, and ecological constraints. Therefore, this master program covers several interdisciplinary topics, such as energy conversion technologies, including different biochemical routes, system design and optimization from both technical and economic perspectives, project management, legal restrictions and aspects of climate change, pollution and the integration of renewable energies.

2.3 The Syllabus

In order to ease the acknowledgement of the studying activities, the workload has been planned from the beginning taking **ECTS** as a reference.

Co-funded by the Erasmus+ Programme of the European Union

The developed Master Program foresees 60 ECTS (equivalent) of front lessons and 60 ECTS of thesis/internship/project and side activities. In particular, for the BBChina Master Program, the latter include the newly developed "Entrepreneurship Course".

This is in line with the Chinese University master structure, where the standard Master Program lasts 2 and a half year distributed as in the following:

- 1st Year; Front lessons (60 ECTS equivalent);
- 2nd Year and 1st half of 3rd Year; Project (basis for the Thesis), Traineeship/internship (if foreseen), and Master Thesis (60 ECTS equivalent); in the BBChina Master Program here the Entrepreneurship Course is included.

2.3.1 Conversion of the Credits

To convert from ECTS to Chinese Credits the equivalence in terms of Front Lesson Hours was considered. The following assumptions were made:

- 1 ECTS = 7~9 front teaching hours;
- then, 2 ECTS ~ 1 Chinese Credit; this is because 1 Chinese credit corresponds to nearly 16~18 hours of front teaching. This conversion choice is in line with what has been applied in some cases of joint curriculum in between EU and China.

It is important to point out that there is not even a unique correspondence in between the Credits and Chinese Credit Hours all across the three different Chinese Universities and, in general, all across the Chinese Universities.

Co-funded by the Erasmus+ Programme of the European Union

2.3.2 First Year: front lessons

Regarding the front lessons, 1st Year of the Program, the Chinese Structure foresees the following distribution:

- Public Courses
- Degree Courses
- Obligatory Courses
- Elective Courses

The syllabus of the BBChina Master Program was developed to fit this structure.

Regarding the single parts of the syllabus structure developed for the BBChina Master Program:

- **Public Courses**; these are Courses such as "Foreign language", "Dialectics of Nature" and "Theory and Practice of Socialism with Chinese Characteristics". These Courses are common all through the Chinese Universities. **These courses were not accounted for the total amount of ECTS of the Program, because these are side courses not directly related to the Degree**. In terms of Chinese Credits, their amount is in general around 6 Credits, corresponding to nearly 126 teaching hours. *Please note* that the relation between Chinese Credits and front teaching hours for the Public Courses is different from the rest of the Courses.

- **Degree Courses;** these are the courses that are necessary to get the "Degree in". These are the basis for the Master Title and may not necessarily be related to the BBChina Topic "Bio-Based Circular Economy". As a matter of example, at **TJU** "College of Environmental Science and Engineering", these are the courses necessary to achieve the degree (M.Eng.) in "Environmental Engineering".

Co-funded by the Erasmus+ Programme of the European Union

- In terms of credits, their weight is around 8~9 Chinese Credits that corresponds to 144~162 teaching hours. The amount varies all through the different Chinese Institutions. For the BBChina project, their amount is equivalent to *20 ECTS*.

- **BBChina Obligatory Courses**; these are the obligatory courses of the BBChina; these courses are in strict correlation with the Title of the Degree and depend from it. As a matter of example, at the College of Environmental Science and Engineering of Tongji University, the Obligatory courses are "Integrated Solid Waste Management" and "Wastewater Treatment: Theory and Technology".

  - These courses weights *10 ECTS*, this is equivalent to 5~6 Chinese Credits and around 90~108 teaching hours.

  - These courses were developed, integrated or implemented from scratch by the BBChina Project (activity of Work Package 3 "Master Course Implementation").

- **BBChina Elective Courses;** these are the elective courses of the BBChina. These courses are, in general, not strictly correlated with the title of the Degree. The student must choose the courses in between the available ones:

  - The total of the chosen courses corresponds to 30 ECTS; this is equivalent to ~12 Chinese Credits and around 216 teaching hours.

  - These courses were developed, integrated or implemented from scratch by the BBChina Project (activity of Work Package 3 "Master Course Implementation").

Co-funded by the Erasmus+ Programme of the European Union

Therefore, within each student's career, the credit weight of the **BBChina Obligatory Courses** (10 ECTS) and of the **BBChina Elective Courses** (30 ECTS) is in total equivalent to around 40 ECTS on a total of 60 ECTS equivalent of front teaching.

Course title	Obligatory/Optional
Bioeconomy, Energy Market and Green Market	Optional TJU, ECUST and SCU
Biomass Energy: Technology and Application	Obligatory SCU Optional TJU and ECUST
Biomass process engineering for Bioenergy Production	Obligatory ECUST Optional TJU and SCU
Bioreactor Engineering	Obligatory ECUST Optional TJU and SCU
Chemistry of carbohydrates	Obligatory SCU Optional TJU and ECUST
Combustion	Optional TJU ECUST and SCU
Integrated Solid Waste Management	Obligatory TJU Optional ECUST and SCU
Life Cycle Assessment	Optional TJU, ECUST and SCU
Plant development biology	Obligatory SCU Optional TJU and ECUST
Renewable Energy Technologies	Optional TJU, ECUST and SCU
Thermal Waste management and WtE technologies	Optional TJU, ECUST and SCU
Wastewater Treatment: Theory and Technology	Obligatory TJU Optional ECUST and SCU

The table above summarises which course and in which University each of the 12 BBChina Courses are obligatory or optional (elective).

2.3.3 Second and Third (1st half) Year: program completion

During the second year and the first half of the third year, the structure remains the same of the “Standard” Chinese Master Program. This period is devoted to develop the Master Project (which is the basis for the Thesis), to the Traineeship/Internship period (if this is foreseen), and then to the preparation of the Master Thesis. In the BBChina Master Program this is the period when the

Co-funded by the Erasmus+ Programme of the European Union

Course on entrepreneurship, that was developed within the BBChina project (Work Package 8), is held.

2.3.4 Implemented Courses

All across the different Institutions, we have 12 BBChina Courses running.

Course title	Status before the BBChina	Percentage of new material developed
Bioeconomy, Energy Market and Green Market	Not available in any of the Involved Chinese or European Universities	100%
Biomass Energy: Technology and Application	Not available in any of the Involved Chinese or European Universities	100%
Biomass process engineering for Bioenergy Production	Course already available at ECUST	20%
Bioreactor Engineering	Course already available at ECUST	40%
Chemistry of carbohydrates	Course already available at SCU	25%
Combustion	Course already available at TJU	70%
Integrated Solid Waste Management	Not available in any of the Involved Chinese Universities	100%
Life Cycle Assessment	Not available in any of the Involved Chinese or European Universities	100%
Plant development biology	Course already available at SCU	25%
Renewable Energy Technologies	Not available in any of the Involved Chinese Universities	100%
Thermal Waste management and WtE technologies	Course already available at TJU	70%
Wastewater Treatment: Theory and Technology	Course already available at TJU	30%

The table above shows the status of the BBChina courses before the work performed through the project implementation and the percentage of new material developed by the BBChina project in order to fit the needs of the new Master Program compared to the previous status. Some of the BBChina courses were not present in any of the Chinese Universities before the project start and they were developed and implemented from scratch. In this case of newly developed courses, the new material implemented is 100%.

More details on the actions performed within each course can be found in the chapter 5 ”Courses and Material Implementation process”.

Co-funded by the Erasmus+ Programme of the European Union

2.3.5 The study plan

The BBchina Study Plan can be summarised as in the following table:

	Chinese Credits / Hours	ECTS	Notes	Year
Public Courses	6/126	*Not applicable*	Courses such as "*Foreign language*", "*Dialectics of Nature*" and "*Theory and Practice of Socialism with Chinese Characteristics*"	YEAR 1
Degree Courses	8~9 / 144~162	20	These are the courses that are necessary to get the *"Degree in"*	
BBChina Obligatory Courses	5~6 / 90~108	10	These are the obligatory courses of the BBChina	
BBChina Elective Courses	12/216	30	These are the elective courses of the BBChina	
Project + entrepreneurship + Traineeship/internship Master Thesis	Chinese system doesn't calculate credits for this part	30	Entrepreneurship Course, Project elaboration, Traineeship/Internship	YEAR 2 & First half YEAR 3
		30	Master Thesis	
Total:		120		

2.4 Approval and Accreditation

The BBChina program adds a new research orientation under the existing second-level discipline (such as Environmental Engineering, Thermal Engineering). A "Second-level discipline" is what in terms of the BBChina general Syllabus presented above a "Master Degree in" is, and the "research orientation" is the "Program in". The procedure to add a new research orientation is internal to the University and it is only necessary the approval of the Board and related Offices.

In principle in China, the university independently sets the second-level disciplines and awards the related degree (such as Environmental Engineering,

Co-funded by the Erasmus+ Programme of the European Union

Thermal Engineering, etc.). Nevertheless, there are strong restrictions to the approval of new second-level disciplines: it requires that a relatively independent professional knowledge system exists, and the university should have a team of teachers with a reasonable knowledge structure, age structure and professional technical position structure, which can provide a series of courses, research projects, required for the training of graduate students. Moreover, apart from these restrictions, the second-level disciplines catalogue is updated every five years.

Therefore, it usually takes several years to prepare the conditions to start the process of request and then set up a new second-level discipline, and then get accreditation by the Ministry of Education via the Catalogue.

In particular, regarding the involved Chinese Universities:

- at **TJU** the last new version of the catalogue was published, after the approval process, in January 2019; the next update is foreseen in 2024;
- at **ECUST** the last catalogue update was in 2014; the next one was expected in 2020 but it has been delayed to 2021, due to the COVID-19 Pandemic;
- at **SCU** the last update of the second-level discipline catalogue was published in 2018, and the next update is thus foreseen in 2023.

Wider details are available within chapter 7 “BBChina and the Accreditation Process at National Level”.

2.4.1 Master Program approval and status

The full description of the procedure followed is available within chapter 6 “Master Program Approval Procedures in Chinese HEIs”.

The three different Chinese HEIs involved follow different approval procedures both in the bureaucratic steps and timetable: although the procedure at **TJU** and

ECUST have some points in common, the procedure at **SCU** differs from the other in a significant way.

The Syllabus was submitted to the University boards for approval in November 2018 (**TJU** and **ECUST**) and December 2018 (**SCU**).

Some further changes to the Syllabus were discussed and approved during the Project Management Meeting at **MDH** in January 2019. The courses "Combustion" and "Thermal Waste management and WtE technologies" were added to the syllabus.

These changes were submitted and approved at **TJU** and **ECUST** in order to be in place for the first edition of the Master, but due to the time schedule, further changes were not anymore allowed at **SCU**.

In July 2019 The BBChina Master Program is available in all the involved Chinese HEIs within the Academic Year 2019/20 educational offer. At **SCU** the courses "Combustion" and "Thermal Waste management and WtE technologies" are not available. Moreover, since the educational offer at **SCU** already includes a course "Combustion" (that is not the course developed at **TJU** for BBChina) it was decided to include this course into the educational offer for BBChina for the Academic Year 2019/20 in order to make the offer more homogeneous as possible with the other Chinese HEIs involved.

The updated syllabus was then submitted at **SCU** for approval in November 2019 and the new courses submitted for inclusion in June 2020. After examining the request, the **SCU** offices replied that the syllabus of these new courses is quite similar with the already running courses "Combustion Explosion Theory" (Ref.Code M0817Z201) and "Treatment and management of solid waste"

Co-funded by the Erasmus+ Programme of the European Union

(Ref.Code M08300205). Therefore, the Offices did not consider necessary to set the proposed new courses and then included in the offer the already running courses instead of the new ones.

Therefore, for the Academic Year 2020/21, the educational offer for the BBChina Master Program is homogeneous all across the three Chinese HEIs, except for **SCU**, where the course “Combustion Explosion Theory” is available instead of the BBChina implemented course “Combustion”, and “Treatment and management of solid waste” is available instead of the BBChina implemented course “Thermal Waste management and WtE technologies”.

Co-funded by the Erasmus+ Programme of the European Union

3 Definition of the Master Program Structure

In order to make it possible the inclusion of the new Master Program in the Chinese University System, the syllabus was designed to fully comply with the Chinese university structure, but as much as possible in line with Bologna process. In fact, the BBChina Master Program implementation aims to comply as much as possible with the structure of an EU master, thus finding a balance between Chinese credits and European Credits (European Credit Transfer and Accumulation System, ECTS). By the way, since there is no precise correspondence about the credit allocation system of the different Chinese HEIs, it is not possible to ensure such a precise correspondence.

In the phase of definition of the Syllabus, it has been decided to only use ECTS as a reference for building the structure, and then each Chinese university translated the correspondent credits following the rules of its institution. This is also because there is not even a homogeneous Chinese Credit allocation system across the different Chinese HEIs involved.

The present document presents the general structure of the implemented Master Program in the following pages; thereafter it presents, as annexes, how the structure was implemented at each College/Institution level. The **green texts** are the comments explaining the structure. Items of the Syllabus that varies depending on the implementing institution are presented in [*square brackets italic*].

Co-funded by the Erasmus+ Programme of the European Union

The Master Program was implemented as a "Program on Bio-Based Circular Economy" within the existing Master degrees in the three involved Chinese universities. Depending on the Master, the Degree Offered is Master of Science (M.Sc.) or Master of Engineering (M.Eng.)

University of [*University*]

Study Plan for Master Degree in

"[*Degree -Depending on HEI/College*]"

Program on

"Bio-Based Circular Economy"

Degree Offered: [*M.Sc./M.Eng. depending on HEI*].

As a matter of example, at the "College of Environmental Science and Engineering" in Tongji University the Master Program is the following, offering a Master of Engineering

Tongji University

College of Environmental Science and Engineering

Study Plan for Master Degree in

"Environmental Engineering"

Program on "Bio-Based Circular Economy"

Degree Offered: M.Eng.

Co-funded by the Erasmus+ Programme of the European Union

Objectives and Learning Outcomes of the Master:

The proposed program is designed to prepare highly-skilled engineers and managers in the biomass to energy and bioproducts chain, who will be able to coordinate the design and implement solutions to solve challenges with respect to technical, economic, environmental, and ecological constraints. Therefore, this master program will cover the topics, such as energy conversion technologies, including different biochemical routes, system design and optimization from both technical and economic perspectives, project management, legal restrictions and also aspects of climate change, pollution and the integration of renewable energies.

The Program will additionally be fostered through lectures oriented to the development of entrepreneurship skills for sustainable business growth.

The master program is set-up and organised within the ERASMUS+ Project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina), co-funded by the European Union.

The program belongs to the Department/School/Faculty of ***[Depending on the Single HEI]***.

The Program has been adopted and implemented in the following Institutions

- **Tongji University (TJU)**:
  - College of Environmental Science and Engineering
  - School of Mechanical Engineering
- **East China University of Science and Technology (ECUST)**:
  - School of Mechanical and Power Engineering
- **Sichuan University, Chengdu (SCU)**:
  - College of Life Sciences
  - College of Chemical Engineering and Technology
  - College of Chemistry
  - Institution of New Energy and Low-Carbon Technologies

PROGRAM OBJECTIVES

The objective is to educate highly qualified engineers, managers, researchers and high-level operators in the field of biomass to energy and bioproducts, who will be able to complexly apply the acquired knowledge to form, assess and make effective decisions on biomass-based projects, on the basis of scientific argumentations. The graduate will be able to follow the complex biomass to energy and bioproducts chain, to optimise each step of the chain and choose the adequate technology for every different step. The graduate will also be able to select the best conversion route for each raw material considered as the starting point and will be able to deal with the technology, market and regulation issues and to operate within the green market. Furthermore,

Co-funded by the Erasmus+ Programme of the European Union

the graduate will have the necessary entrepreneurship knowledge and skills to start-up his/her own biomass-based activities.

ACQUIRED COMPETENCES, ABILITIES AND SKILLS:

- In-depth knowledge of the biomass and raw material provision sources and routes, including agricultural and forestry practices as well as algae production methodologies.
- In-depth knowledge of waste to energy technologies and waste management.
- In-depth knowledge of the biomass to energy chain issues, including logistics.
- In-depth knowledge in the biomass to energy conversion technologies, and their fundamental thermochemical, biological, chemical and other technological concepts.
- In-depth knowledge of the main biomass to energy plant typologies.
- In-depth knowledge of the chemistry basis of the biofuel production, and related technologies from 1st generation to 4th generation biofuels.
- In-depth knowledge of the biorefinery concept, and of the routes for bioproducts production including bioplastics, biochemicals, soil amendments, building materials, pharmaceuticals etc.
- In-depth knowledge in the bio-based economy, market and policy issues.
- Advanced knowledge in other energy conversion technologies (including renewable energy technologies “other” than biomass) and energy efficiency.
- Advanced knowledge of the legislative and support strategies to rule and foster the renewable energy development, with a special focus on the bioenergy chain.
- Advanced knowledge in the green market strategies.
- Advanced knowledge in the environmental issues related to energy production, sustainability and Life Cycle Assessment concept and tools.
- Advanced knowledge in the secondary pollution control issues related to biomass production and use.
- Advanced knowledge in the renewable electricity integration in the grid.
- Ability to develop and implement strategies to address major challenges in the biomass to energy chain.
- Ability to merge knowledge from multi-disciplinary fields to design, develop and assess new solutions for biomass to energy and bioproducts challenges.
- Ability to tackle issues in the design of the biomass to energy and bioproducts conversion routes.
- Ability to develop market strategies for bioproducts.
- Ability to analyse and improve a biorefinery process.
- Advanced entrepreneurial skills.
- Ability to pursue a Ph.D. degree.

The previous list of learning outcomes will be, if necessary and depending on the Institution/Degree offered, shortened in order to be better fit to the single implemented Master Program. The presented list includes and summarises all the learning outcomes of the different Master Programs.

Co-funded by the Erasmus+ Programme of the European Union

General Rules and Conditions:

The proposed program is designed to last 2.5 years.

AREAS OF SPECIALTY FOR ADMISSION TO THE M.ENG. PROGRAM:

The Area of Admission depends on the Degree in which the Master Program is included. Considering the different Institutions involved, the Master is accessible to

Holders of the bachelor's degree in:

- Engineering (Mechanical Engineering, Chemical Engineering, Environmental Engineering, Thermal Engineering, etc.)
- Environmental Sciences
- Agricultural and Forestry Science
- Chemistry
- Biology
- Biotechnology

As a matter of example, in the case of the implementation at the College of Environmental Science and Engineering of Tongji University, the Master is accessible to

Holders of the bachelor's degree in:

- Engineering (Environmental Engineering, Chemical Engineering, Thermal Engineering, etc.)
- Environmental Sciences
- Biotechnology
- Chemistry

The chosen admission B.Sc. background corresponds to the one necessary for the related Degree M.Eng. in Environmental Science

Co-funded by the Erasmus+ Programme of the European Union

Study Plan:

This Study Plan is equivalent to 120 ECTS (European Credit Transfer and Accumulation System) distributed as follows:

	Chinese Credits / Hours	ECTS	Notes	Year
Public Courses	6/126	*Not applicable*	Courses such as "*Foreign language*", "*Dialectics of Nature*" and "*Theory and Practice of Socialism with Chinese Characteristics*"	YEAR 1
Degree Courses	8~9 / 144~162	20	These are the courses that are necessary to get the *"Degree in"*	
BBChina Obligatory Courses	5~6 / 90~108	10	These are the obligatory courses of the BBChina	
BBChina Elective Courses	12/216	30	These are the elective courses of the BBChina	
Project + entrepreneurship + Traineeship/internship Master Thesis		30	Entrepreneurship Course, Project elaboration, Traineeship/Internship	YEAR 2 & First half YEAR 3
		30	Master Thesis	
Total:		120		

The syllabus was implemented to fully comply with the Chinese University structure, but efforts have been done to comply as much as possible with the Bologna Process. This also meets the efforts that the 3 Chinese HEIs are actually implementing to adopt a conversion system from Chinese Credits to ECTS.

In order to ease the acknowledgement of the studying activities, the workload has been planned from the beginning based on the **equivalence with ECTS**.

The course foresees 60 ECTS of front lessons (excluding the obligatory Public Courses since they are not related to the Degree Topic) and 60 ECTS of thesis/internship/project and side activities.

This is in line with the Chinese University master structure, where the Master Program lasts 2 and a half year distributed as in the following:

- 1st Year; Front lessons

Co-funded by the Erasmus+ Programme of the European Union

- 2nd Year and 1st half of 3rd Year; Project (basis for the Thesis), Traineeship/internship (if foreseen), Entrepreneurship Course and Master Thesis

Conversion ECTS -> Chinese Credits

The conversion has been performed through Front Lesson Hours

- 1 ECTS = 7~9 front teaching hours (depending on University)
- then: 2 ECTS ~ 1 Chinese Credit (this is in line with what has been applied in some cases of joint curriculum in between EU and China)

It is important to point out that there is not a unique correspondence in between the Credits and Chinese Credit Hours all across the three different Chinese Universities.

Regarding the single parts of the structure:

- **Public Courses**; these are Courses such as "Foreign language" (in our case English will be deemed preferable in order to allow the students to be ready to use the basis material of the BBChina courses), "Dialectics of Nature" and "Theory and Practice of Socialism with Chinese Characteristics". These Courses are common all through the Chinese Universities. These courses have not been included within the total amount of ECTS. In terms of Chinese Credits, their amount is in general around 6 Credits, corresponding to around 126 teaching hours.
- **Degree Courses;** these are the courses that are necessary to get the "Degree in". These are the basis for the Title and may not necessarily be related to the Topic "Bio-Based Circular Economy".
    - In terms of credits, their weight is around 8~9 Chinese Credits that corresponds to 144~162 teaching hours. The amount varies all through the different Chinese Institutions. For the BBChina project, their amount has been defined in *around 20 ECTS*.
    - These Courses and the related materials, being in common with all the other Master Programs, are held in Chinese or English depending on the course.

Co-funded by the Erasmus+ Programme of the European Union

- **BBChina Obligatory Courses**; these are the obligatory courses of the BBChina; these courses are in strict correlation with the Title of the Degree. As a matter of example, at the College of Environmental Science and Engineering of Tongji University, the Obligatory courses are "Integrated Solid Waste Management" and "Wastewater Treatment: Theory and Technology".
    - These courses correspond to *10 ECTS*; this is equivalent to 5~6 Chinese Credits and around 90~108 teaching hours.
    - The basis material of these courses is in English, although the courses can be taught in English or Chinese.
    - These courses were developed, integrated or implemented from scratch by the BBChina Project (WP3).
- **BBChina Elective Courses;** these are the elective courses of the BBChina. These courses are in general not strictly correlated with the Title of the Degree. The student must choose the courses in between the ones available.
    - These courses correspond to *30 ECTS*; this is equivalent to ~12 Chinese Credits and around 216 teaching hours.
    - The basis material of these courses is in English, although the courses can be taught in English or Chinese.
    - These courses were developed, integrated or implemented from scratch by the BBChina Project (WP3).
- The **Degree Courses** and the **BBChina Obligatory Courses** together corresponds to a total of around 30 ECTS while the **BBChina Elective Courses** corresponds to around 30 ECTS. In total we have 60 ECTS of front teaching for the degree. Within each student's career, the credit weight of the **BBChina Obligatory Courses** (10 ECTS) and of the **BBChina Elective Courses** (30 ECTS) is in total equivalent to around 40 ECTS on a total of 60 ECTS equivalent of front teaching.
- The **BBChina Obligatory Courses** of one institution become part of the **BBChina Elective Courses** of the other involved institutions. All across the different Institutions, we have the following BBChina Courses (the responsible for preparation in brackets):
    - Bioeconomy, Energy Market and Green Market (MDH)

Co-funded by the Erasmus+ Programme of the European Union

- Biomass process engineering for Bioenergy Production (BBChina Obligatory at ECUST)
- Bioreactor Engineering (BBChina Obligatory at ECUST)
- Combustion (TJU)
- Chemistry of carbohydrates (BBChina Obligatory at SCU)
- Integrated Solid Waste Management (BBChina Obligatory at TJU)
- Biomass Energy: Technology and Application (BBChina Obligatory at SCU)
- Plant development biology (BBChina Obligatory at SCU)
- Life Cycle Assessment (SCU)
- Renewable Energy Technologies (UNIFI)
- Thermal Waste management and WtE technologies (TJU)
- Wastewater Treatment: Theory and Technology (BBChina Obligatory at TJU)

- During the second year and the first half of the third year, the structure remains the same of the "Standard" Chinese Master Program, except for the presence of the Course on entrepreneurship that was developed by the BBChina project.

Within the tables of the following page the program details of the foreseen implementation at Tongji University, College of Environmental Science and Engineering, is presented.

Co-funded by the Erasmus+ Programme of the European Union

Details of the Courses (Example for Tongji University):

I. Public Courses (126 Credit Hours / No equivalence in ECTS):

Course Title	Credits / Hours	ECTS
Foreign Language (English, French, German, Japanese, Russian)	3/72	
Theory and Practice of Socialism with Chinese Characteristics	2/36	
Dialectics of Nature	1/18	

II. Degree Courses (144 Credit Hours/ 19.2 ECTS):

Course Title	Credits / Hours	ECTS
Frontier in Environmental Science and Engineering (in Chinese)	2/36	4.8
Environmental Instrumental Analysis (in Chinese)	2/36	4.8
Academic and Professional Lectures	2/36	4.8
The student must choose 1 course within the following		
The Experiment of Instrumental Analysis (Spectrum Analysis) (in Chinese)	2/36	4.8
The Experiment of Chromatography Analysis (in Chinese)	2/36	4.8
The Experiment of Instrumental Analysis (Biological Analysis) (in Chinese)	2/36	4.8

III. BBChina Obligatory Courses (90 Credit Hours / 12 ECTS):

Course Title	Credits / Hours	ECTS
Integrated Solid Waste Management	3/54	7.2
Wastewater Treatment: Theory and Technology	2/36	4.8

IV. BBChina Elective Courses (216 Credit Hours to be chosen/ 28.8 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Bioreactor Engineering	2/36	4.8
Bioenergy Process Engineering	2/36	4.8
Plant Development Biology	3/54	7.2
Chemistry of Carbohydrates	3/54	7.2
Life Cycle Assessment	3/54	7.2
Biomass Energy: Technology and Application	3/54	7.2
Renewable Energy Technologies	3/54	7.2
Bioeconomy, Energy Market and Green Market	3/54	7.2
Thermal Waste management and WtE technologies	2/36	4.8
Combustion	3/54	7.2

V. Development of entrepreneurial Skills (Supporting E&T action / 6 ECTS)

Co-funded by the Erasmus+ Programme of the European Union

The learning activities related to the promotion of the entrepreneurial spirit will focus on the development of the following skills: self-branding, team building, creative thinking/analytical thinking, resilience, leadership, market, gaining the customer perspective, lean start-up, economic and financial planning, design thinking for start-up, how to prepare a pitch, patent, market, value proposition, and understanding the mechanisms of investment of a venture capital and grants.

VI. Project Development (24 ECTS i.e. 30 ECTS *minus* entrepreneurial skills ECTS):

Project assignment is combined with thesis work (1 year after enrolment). Each master student should participate in the professional practice and the relevant research projects for the thesis needs. Graduate students are required to submit thesis proposal and write a professional practice summary report.

VII. Master Thesis (30 ECTS):

A Master's thesis should be carried out by the student independently under the guidance of his/her mentor or advisor, 1 year after enrolment. The time for the thesis work from the date of the approval of thesis proposal (1-1.5 years after enrolment) should not be less than 1 year in principle. The general procedures for Master thesis are: literature reading and critical review → thesis proposal → scientific research → writing thesis → thesis defence.

The Master's degree certification will be awarded only for the students who have satisfactorily completed all the coursework and thesis requirements and those who meet the requirement of Regulations Concerning Academic Degree in the People's Republic of China. Students who have completed the coursework requirements but have failed to complete the thesis requirement will be provided a certification for completing the coursework only. At least one publication in an academic journal or academic conference is to be made from a thesis.

The evaluation of the thesis should follow the following procedures:

(i) Evaluation made by the adviser and modification made by the student.

(ii) Deliver the thesis to two experts (professors or associate professors, the advisor is excluded) for peer review one month before the defence.

(iii) Obtain permission for the thesis defence. Thesis defence can be done only after the thesis review by the two experts are passed.

(iv) Thesis defence and obtain permission from the thesis jury (Thesis Committee), which should consist of 3-5 professors or associate professors.

Co-funded by the Erasmus+ Programme of the European Union

4 Syllabus definition process

The process of the definition of the Syllabus started from the Kick-Off meeting (**KOM**, February 2018) and closed right after the second Project Management Unit meeting (**PMU 2**, January 2019).

The main structure of the syllabus and the position of the Master Program within the educational offer of the different Universities were drafted during the Kick Off meeting and confirmed within the first Project Activity Unit meeting (**PAU 1**) at **TJU**. In the meantime, the first draft version of the Education and Training Needs Assessment (**ETNA**) was prepared and then also the first draft of the Syllabus, including a first proposal of Courses list, based on the objectives of the Master and the already available Educational offer within the three different Chinese Universities, was drafted and discussed during **PAU 1**.

The results of **PAU 1** led to the definition of the first draft of the Syllabus, sent to the International Advisory Board (**IAB)** for feedback and comments in August 2018.

The comments of the IAB were discussed during the Project Activity Unit meeting (**PAU 2**) at ECUST in October 2018 and led to the first version of the Syllabus that was presented for approval at Institutional level for the three Universities at the end of 2018 (November-December), together with the agreed list of courses.

The final version was the result of the **PMU 2** at MDH in January 2019 where TJU announced the possibility to include into the BBChina courses also the already existing courses of "*Combustion*" and "*Thermal Waste management and WtE technologies*". During the meeting it was proposed and accepted to substitute the Courses "*Biological resources and Natural Products Chemistry*" and "*Meta-*

Omics" proposed by SCU at the beginning of the definition process with the new ones, since these new courses were considered more in line with the objectives of the Program.

Co-funded by the Erasmus+ Programme of the European Union

5 Courses and Material Implementation process

The following table presents the status of the courses before the BBChina, the steps performed in order to prepare the material for the implementation of the Master Program, the Partner(s) in charge of the actions, and an evaluation of the developed material in terms of percentage compared to the status before the project implementation.

Title of the Course	Status before the BBChina	Action performed by BBChina
Bioeconomy, Energy Market and Green Market	Not available in any of the Involved Chinese or European Universities	MDH coordinated the development of the Course from Scratch to fit the BBChina Master Program. *What has been changed/implemented?* The course is new and has been developed from scratch. 100% of the material is newly developed by the Project.
Biomass Energy: Technology and Application	Not available in any of the Involved Chinese or European Universities	SCU coordinated the development of the Course from Scratch to fit the BBChina Master Program; contribution from already existing parts of courses from European Universities *What has been changed/implemented?* The course is new and has been developed from scratch. 100% of the material is newly developed by the Project.
Biomass process engineering for Bioenergy Production	Course already available at ECUST	ECUST shares the material that is updated and upgraded to fit the BBChina Master Program. *What has been changed/implemented?* The program was updated with the latest progress in the biomass to energy field. 20% of the material is newly developed by the Project.

Title of the Course	Status before the BBChina	Action performed by BBChina
Bioreactor Engineering	Course already available at ECUST	ECUST shares the material that is updated and upgraded to fit the BBChina Master Program. *What has been changed/implemented?* Several material added, such as more examples about how to perform chemostat experiments were made available for the students, and practice materials were also added. In general, teaching skills of the teachers were improved by using the real experience acquired through the staff mobility in Europe, in particular through the plant visits held at Rostock University. 40% of the material is newly developed by the Project.
Chemistry of carbohydrates	Course already available at SCU	SCU shares the material that is updated and upgraded to fit the BBChina Master Program. *What has been changed/implemented?* For this course the parts related to “Preparation, structural character, and transformation of hemicellulose” and “Preparation, structural character, and transformation of cellulose” have been added, in order to better target the topic biofuel; these topics are related to the biomass utilization because the products of transformation could be alcohol or methanol. Also in the discussion sectors, the teacher will use more examples related with biomass utilization such as using the waste straw as substrate to get biofuel. 25% of the material is newly developed by the Project.

Co-funded by the Erasmus+ Programme of the European Union

Title of the Course	Status before the BBChina	Action performed by BBChina
Combustion	Course already available at TJU	TJU shares the material that is updated and upgraded to fit the BBChina Master Program. At SCU the already existing course "Combustion Explosion Theory" (Ref. Code M0817Z201) is instead adopted. *What has been changed/implemented?* The previous course materials were in Chinese and used for the students in Thermal Engineering. They need to be changed into English version and updated according to the BBChina program and syllabus, suitable for students with different background. 70% of the material is newly developed by the Project.
Integrated Solid Waste Management	Not available in any of the Involved Chinese Universities	TJU coordinated the development of the Course from Scratch to fit the BBChina Master Program. *What has been changed/implemented?* The materials are new and need to be developed according to the BBChina program and syllabus. 100% of the material is newly developed by the Project.
Life Cycle Assessment	Not available in any of the Involved Chinese or European Universities	SCU coordinated the development of the Course from Scratch to fit the BBChina Master Program; contribution from already existing parts of courses from European Universities *What has been changed/implemented?* The course is new and has been developed from scratch. 100% of the material is newly developed by the Project.

Title of the Course	Status before the BBChina	Action performed by BBChina
Plant development biology	Course already available at SCU	SCU shares the material that is updated and upgraded to fit the BBChina Master Program. *What has been changed/implemented?* For this course a part related to "The regulation of fruit development" has been newly developed and included in order to better target the Bioenergy topic. This is because fruits or seeds of several plants are rich in biomass that can be processed to biofuel, as for example oil derived from Jatropha curcas, palm oil fruits and sunflower seeds. The regulation of fruit development may affect the contents of raw material available in these fruits or seeds. 25% of the material is newly developed by the Project.
Renewable Energy Technologies	Not available in any of the Involved Chinese Universities	UNIFI coordinated the development of the Course from Scratch to fit the BBChina Master Program. *What has been changed/implemented?* The course is new and has been developed from scratch. Material has been also specially targeted to the China site specific needs. 100% of the material is newly developed by the Project.
Thermal Waste management and WtE technologies	Course already available at TJU	TJU shares the material that is updated and upgraded to fit the BBChina Master Program. At SCU the already existing course "Treatment and management of solid waste" (Ref. Code M08300205) is instead adopted. *What has been changed/implemented?* The previous course materials were in Chinese and used for the students in Thermal Engineering. They need to be changed into English version and updated according to the BBChina program and syllubus, suitable for students with different background. 70% of the material is newly developed by the Project.

Co-funded by the Erasmus+ Programme of the European Union

Title of the Course	Status before the BBChina	Action performed by BBChina
Wastewater Treatment: Theory and Technology	Course already available at TJU	TJU shares the material that is updated and upgraded to fit the BBChina Master Program. *What has been changed/implemented?* The previous course is for IESD (Institute of Environment for Sustainable Development) foreign students in Environmental Engineering. The materials need to be updated according to the BBChina program and syllabus, suitable for students with different background. 30% of the material is newly developed by the Project.

5.1 Contents of the BBChina Courses

5.1.1 Bioeconomy, Energy Market and Green Market (MDH)

No	Course Content
1	Introduction to the bioeconomy
2	Techno-economic analysis – I : Capital cost and the manufacturing cost
3	Techno-economic analysis – II: Life cycle cost and learning curve (assignment 1)
4	Biomass Market – I: supply chain (demand and supply) and pricing mechanism
5	Biomass Market – II: regional and global market, industry outlook (assignment 2)
6	Waste management
7	Regulations and policies – I: Standards and Labels related to Bioenergy and Biobased Products
8	Regulations and policies – II: Control of waste and pollutant emissions
9	Regulations and policies – III: Incentives strategies (assignment 3)
10	Bioenergy financing
11	Business model
12	Circular economy
13	Green Market (not limited to bioenergy, such as carbon market)
14	Project presentation

Co-funded by the Erasmus+ Programme of the European Union

5.1.2 Biomass Energy: Technology and Application (SCU)

No	Course Content
1	Course overview; Introduction of biomass energy and its significance
2	The development of biomass energy in different countries
3	The conversion technology for biomass energy: 1. Physical conversion technology
4	The conversion technology for biomass energy: 2. Direct combustion technology
5	The conversion technology for biomass energy: 3. Gasification technology
6	The conversion technology for biomass energy: 4. Pyrolysis and direct liquefaction technology
7	The conversion technology for biomass energy: 5. Biodiesel production technology
8	The conversion technology for biomass energy: 6. Bio-ethanol and Bio-butanol production technology
9	The conversion technology for biomass energy: 7. Hydrogen production technology
10	The conversion technology for biomass energy: 8. Biogas production technology
11	Introduction of experimental technology for biomass
12	Introduction of analysis methods for biomass
13	Course review and discussion

Co-funded by the Erasmus+ Programme of the European Union

5.1.3 Biomass process engineering for Bioenergy Production (ECUST)

No	Course Content
1	Bioresource and Biorefinery
2	Biofuels and Biochemicals
3	Overcoming Biorecalcitrance
4	Enzymes and Microbes
5	Biorefining Process
6	Discussion sessions

5.1.4 Bioreactor Engineering (ECUST)

No	Course Content
1	Course overview
2	Mass balance and calculation
3	Metabolism overview
4	Biokinetics
5	Bioenergetics
6	Midterm review and discussion
7	Metabolic control and flux analysis
8	Flow and mass transfer in bioreactors
9	Bioprocess design
10	Bioreactor scale up
11	Case study

Co-funded by the Erasmus+ Programme of the European Union

5.1.5 Chemistry of carbohydrates (SCU)

No	Course Content
1	Course overview: origin of sugars
2	Structure, configuration, conformation and tautomerization of monosaccharide
3	Multifunctional group chemistry of saccharide
4	Oligosaccharide and polysaccharide
5	Class discussion
6	Forms of saccharide in solvents and related interactions
7	Xylose transformations
8	Fructose transformations
9	Glucose transformations
10	Preparation, structural character, and transformation of hemicellulose
11	Preparation, structural character, and transformation of cellulose
12	Class discussion

Co-funded by the Erasmus+ Programme of the European Union

5.1.6 Combustion (TJU)

No	Course Content
1	Introduction: Brief history of combustion science; Application of Combustion Science; Combustion pollution; Methodological study on combustion; Chemical balance; Thermal chemical; Reaction rate theory; Effective collision theory; Arrhenius Laws; Reaction rate factors; Chain reaction theory; Chain ignition
2	Fuel ignition theory: Thermal deflagration theory of combustion process; Semyonov thermal ignition theory; Forced ignition and Natural fire; Basic form of flame propagation; Flame normal propagation of combustible gas; Velocity of propagation of flame; Dynamic combustion and diffusion combustion
3	Flame propagation and Stability Theory: Basic flame propagation mode; Flame normal propagation of combustible gas; Flame normal propagation theory; Velocity of propagation of flame; Dynamic combustion and diffusion combustion; methods of flame stability
4	Turbulent combustion theory and modelling: Model of Turbulent Premixed Flame(Eddy breakup model); Stretch-cut-and-slide combustion model; Mean reaction rate of Turbulent combustion
5	Liquid-fuel combustion: Basic process of liquid-fuel combustion; Spray mode; Evenness of spray; Stefan flow of droplet evaporation; Converting film theory of droplet evaporation in forced draft; Diffusion combustion of droplet in relativity static environment
6	Combustion Theory of coal: Stefan flow of carbon ductile combustion; Combustion rate of carbon ductile; Diffusion combustion of carbon ductile under high temperature; Basic process of liquid-fuel coal

Co-funded by the Erasmus+ Programme of the European Union

5.1.7 Integrated Solid Waste Management (TJU)

No	Course Content
1	Course overview
2	Solid waste characterization
3	Solid waste collection and transportation
4	Solid waste pre-treatment
5	Biological treatment of solid waste
6	Course discussion
7	Thermochemical treatment of solid waste
8	Solid waste solidification/stabilization
9	Land application of solid waste
10	Hazardous waste treatment, disposal and reuse
11	Life cycle assessment for integrated solid waste management
12	Course review and discussion

5.1.8 Life Cycle Assessment (SCU)

No	Course Content
1	Introduction and Overview to Life Cycle Assessment (LCA)
2	Goal and Scope
3	Introduction to Life Cycle Inventory
4	The Computational Structure of Life Cycle Inventory
5	Economic Input-Output Life Cycle Inventory
6	Impact Assessment
7	Life Cycle Assessment Related Analysis
8	LCA application in circular economy

Co-funded by the Erasmus+ Programme of the European Union

5.1.9 Plant development biology (SCU)

No	Course Content
1	An Introduction to Flowering Plants
2	Characteristics of Plant Development
3	Cell Intrinsic Information
4	Primary Axis Development
5	Axis Development in the Leaf and Flower
6	Position Relative to a Particular Cell, Tissue or Organ
7	Light
8	Environmental Information other than Light
9	The Coordination of Development
10	Hormone, transcriptional factors and epigenetic regulation of fruit development
11	A Comparison of Plant and Animal Development
12	Course review and discussion

Co-funded by the Erasmus+ Programme of the European Union

5.1.10 Renewable Energy Technologies (UNIFI)

No	Course Content
1	Introduction: Energy potentials from Renewables; Fossils and Nuclear; an overview; Reasons for shifting from Fossil Fuels to Renewables in Oil and/or Gas Producing/Exporting Countries; Optimizing energy production
2	Solar Energy: Solar radiation; Solar Heat; Photovoltaics; Concentrated Solar Energy; Passive solar energy usage; Economics; Design and Applications of a Solar Energy Plant
3	Wind Energy: Wind resource and measurements; Basic Theory; Wind generators; Components of a Wind Generator; Wind Park development; Wind Energy Production
4	Waste to Energy: Waste definition and Classification; Waste Management; Legal, Safety and Environmental Issues, economics
5	RES Driven Desalination: Desalination basics and technologies; Solar thermal energy desalination; Hybrid and other RES desalination
6	Other Renewable Energy Sources: Hydropower and Tidal; Other Renewable Energy Sources: Geothermal
7	Grid Integration of Intermittent energy sources

Co-funded by the Erasmus+ Programme of the European Union

5.1.11 Thermal Waste management and WtE technologies (TJU)

No	Course Content
1	Introduction (definitions) of Thermal treatment technologies; Waste characterisation: Method and Data Processing; Policy & Regulations for waste management
2	Calorific values of wastes; Waste Collection and Source separation
3	Thermal Waste-to-Energy technologies: incineration; Incineration flue gas cleaning; Incineration residue treatment; Design of incinerators
4	Thermal Waste-to-Energy technologies: pyrolysis; Pyrolysis products and their utilization; Design of pyrolysis reactors
5	Thermal Waste-to-Energy technologies: gasification; Gasification based incineration and gasification based power generation; Design of gasification reactors
6	LCA of waste management technologies: compare and choose proper technologies; Discussions and assignments: Waste–to-energy through thermal techniques: which is better?
7	Landfilling and landfill gas utilization; lecture power generation using landfill gas

Co-funded by the Erasmus+ Programme of the European Union

5.1.12 Wastewater Treatment: Theory and Technology (TJU)

No	Course Content
1	Course overview; Water quality
2	Water pollution
3	Wastewater treatment: Preliminary and primary treatment
4	Fundamentals of Biological Treatment
5	Trickling filter
6	Activated sludge process
7	Midterm review and discussion
8	Removal and recovery of nutrients
9	Anaerobic process, on-site wastewater disposal
10	Ecological treatment
11	Sludge treatment and disposal
12	Removal and fate of hazardous organic chemicals
13	Course review and discussion

Co-funded by the Erasmus+ Programme of the European Union

6 Master Program Approval Procedures in Chinese HEIs

The three different Chinese HEIs involved follow different approval procedures both in the bureaucratic steps and timetable: although the procedure at TJU and ECUST have some points in common, the procedure at SCU differs from the other in a significant way. This leads also to different Documentation Produced and attached in the Annexes. The Process for each University is presented in the following.

6.1 Master Program Approval Procedure at TJU

The approval procedure at TJU can be summarised as in the following.

6.1.1 Steps followed by TJU for the approval of the Program

As a first step, the new program and curriculum framework is presented to the staff responsible of the education at College and Department level. After the preparation of the related documents (Syllabus of the Program and of the single courses), these are presented to the Graduate School for approval.

After a possible request of additional information and/or revision of the proposed curriculum the Schools approves the Program. It is then submitted to the college and then to the Graduate School for online approval.

The education program is later (usually late spring) approved by the college (Deputy Dean who is responsible for education) and the Graduate School of TJU. The program/curriculum is then available for master students to be selected.

Co-funded by the Erasmus+ Programme of the European Union

6.1.2 Main dates of the steps of the approval at TJU

In June 2018 the BBChina program and curriculum framework was introduced to the Head of Department of Environmental Engineering, and the Deputy Dean of College of Environmental Science and Engineering, who is responsible for education. In September 2018, the BBChina program and curriculum framework was introduced to the Head of Department of Thermal Engineering, and the Deputy Dean of School of Mechanical Engineering. Positive supports were obtained.

From November to December 2018 application was presented for adding to-be-established BBChina courses (such as Integrated Solid Waste Management, Biomass Energy: Technology and Application, Bioreactor Engineering, Bioenergy Process Engineering, Renewable Energy Technologies, Life Cycle Assessment etc.) into TJU Course System, besides those already established ones such as Wastewater Treatment Theory and Technology, Thermal Waste management and WtE technologies, Combustion.

On December 18, 2018, the applications for adding to-be-established BBChina courses were all approved by the Graduate School of TJU. Therefore, on December 20, 2018 the 2019 education program for Academic master degree in Environmental Science and Engineering, 2019 education program for Professional master degree in Environmental Engineering, as well as the 2019 education program for master degree in Thermal Engineering were revised (including curriculum), in which BBChina program was added as one Research Orientation, and BBChina courses were added. They were submitted to the college and then to the Graduate School of TJU for online approval.

Co-funded by the Erasmus+ Programme of the European Union

In June 2019 the education program for Academic master degree in Environmental Science and Engineering, the education program for Professional master degree in Environmental Engineering, as well as the education program for master degree in Thermal Engineering were approved by the college (Deputy Dean who is responsible for education) and the Graduate School of TJU. The program/curriculum is then available for master students to select BBChina courses.

6.1.3 The "position" of the BBChina Master Program within the Educational Offer at TJU

At TJU, College of Environmental Science and Engineering (Graduate School), the BBChina Master is a Master Program (namely Master Program on Bio-Based Circular Economy) under the Study Plan for Master Degree in "Environmental Engineering". At TJU, School of Mechanical Engineering (Graduate School), the BBChina Master is a Master Program (namely Master Program on Bio-Based Circular Economy) under the Study Plan for Master Degree in "Thermal Engineering".

6.1.4 List of the available official documents related to the Master at TJU

The documents are included in the Annex I and are available for download on the educational management information system for both master student and staffs (*http://yjsxt.tongji.edu.cn*) that is available only for TJU students and staffs (restricted access with credentials).

- 2019 Education program for Professional master degree in Environmental Engineering;

Co-funded by the Erasmus+ Programme of the European Union

- 2019 Curriculum for Professional master degree in Environmental Engineering;
- 2019 Education program for Academic master degree in Environmental Science and Engineering;
- 2019 Curriculum for Academic master degree in Environmental Science and Engineering;
- 2019 Education program for master degree in Thermal Engineering;
- 2019 Curriculum for master degree in Thermal Engineering (in Chinese);
- Syllabus.

6.2 Master Program Approval Procedure at ECUST

The approval procedure at ECUST can be summarised as in the following.

6.2.1 Steps followed by ECUST for the approval of the Program

The preliminary phase usually consists of presenting the new program to the decision makers for the education issues at School (i.e. the Dean) and Department level in order to get a green light for the following steps. Then, the proposer must prepare the documents to be submitted (Syllabus of the Program and of courses involved) to the Graduate School for an approval.

After the approval, the education program is later approved by the Graduate School and then the program becomes available for master students to be selected for their study plans.

6.2.2 Main dates of the steps of the approval at ECUST

In June 2018 the green light to continue the procedure was obtained from the Dean of Mechanical and Power Engineering and the Deputy Dean of graduate

school who is responsible for education, after presenting and explaining to them the BBChina program and curriculum framework.

Between November and December 2018, the proposer applied for adding to-be-established BBChina courses (such as Wastewater Treatment: Theory and Technology, Integrated Solid Waste Management, Bioeconomy, Energy Market and Green Market, Renewable Energy Technologies, Plant development biology, etc.) into ECUST Course System, besides those already established ones such as Bioreactor Engineering and Bioenergy Process Engineering.

The final approval of the education program for Academic master degree in Mechanical and Power Engineering was obtained in July 2019 from the Graduate School of ECUST. Since then, the new BBChina program is available for master students to select BBChina courses.

6.2.3 The "position" of the BBChina Master Program within the Educational Offer at ECUST

At ECUST, School of Mechanical and Power Engineering, the BBChina Master is a Master Program (namely Master Program on Bio-Based Circular Economy) under the Study Plan for Master Degree in "Mechanical and Power Engineering".

6.2.4 List of the available official documents related to the Master at ECUST

The documents are included in the Annex II.

6.3 Master Program Approval Procedure at SCU

The approval procedure at SCU can be summarised as in the following.

Co-funded by the Erasmus+ Programme of the European Union

6.3.1 Steps followed by SCU for the approval of the Program

According to the related regulations in the university, the colleges could fine-tune the study plans before June of each year based on the needs. In generally, college will discuss the application and make decision. The results will be reported to the university and recorded in the related system. In the meantime, the related courses will be added into the system and the student can select them into their training program.

6.3.2 Main dates of the steps of the approval at SCU

In order to ensure the smooth implementation of the project, SCU handed the application reports to the colleges at the end of December 2018 and the colleges approved them during January of 2019. The Colleges signed and stamped on the training program.

In June 2019, SCU handed application of course adding and course related materials to the college, and the Colleges put these information into the University system.

At this step, for the internal procedures of SCU, it was not possible to add new courses compared with the Syllabus presented in December. For this reason the newly added courses "*Combustion*" and "*Thermal Waste management and WtE technologies"* both proposed by TJU at PMU 2 hosted by MDH and there approved, were not included into the 2019/2020 Program. Then, for the Academic Year 2019/20 (first year of the BBChina implementation) at SCU the offer did not include the two BBChina courses above and offered the students the possibility to include in their individual training program also the already existing courses "*Biological resources and Natural Products Chemistry*" and

"*Meta-Omics*", which are in any case already available in the Educational Offer of the Colleges involved at SCU and were considered for the first version of the developed Syllabus. It is then planned to apply for the inclusion of the missing courses starting from the Academic Year 2020/2021 so to stay in line with the other involved Universities.

Moreover, since the educational offer at SCU already includes a course "*Combustion*" (that is not the course developed at TJU for BBChina; the SCU internal code is M0817Z401) it has been decided to include this course into the educational offer for BBChina for the Academic Year 2019/20 in order to make the offer more homogeneous as possible with the other Chinese HEIs involved.

The updated syllabus was then submitted for approval in November 2019 and the new courses submitted for inclusion in June 2020. After examining the request, the **SCU** offices replied that the syllabus of these new courses is quite similar with the already running courses "Combustion Explosion Theory" (Ref.Code M0817Z201) and "Treatment and management of solid waste" (Ref.Code M08300205). Therefore, the Offices did not consider necessary to set the proposed new courses and then included in the offer the already running courses instead of the new ones.

6.3.3 The "position" of the BBChina Master Program within the Educational Offer at SCU

Since the BBChina Master Program is a new project to SCU, the University need to inspect and evaluate its effect. Therefore, this program is still belonging to a branch of the secondary subjects.

Co-funded by the Erasmus+ Programme of the European Union

6.3.4 List of the available official documents related to the Master at SCU

The following documents are presented in Annex III:

- the signed and stamped Syllabus; please be aware that, as above specified, the version of the syllabus approved and stamped considers the list of courses before the changes decided during PMU 2. Thus, the courses "*Biological resources and Natural Products Chemistry*" and "*Meta-Omics*" are present in the syllabus while the courses "*Combustion*" and "*Thermal Waste management and WtE technologies*" are not there included.
- the serial number of course and the print of the web page of the university course selection system;
- an example of approved individual training program, one student for each of the involved colleges.

6.4 Timetable Summary of Approval Procedures and Syllabus Development

The following table summarises and compares the timetable of the main milestones reached all along the path to get to the Master implementation.

Date	Step
June 2018	First draft of the Syllabus available after 1st PAU Meeting. BBChina draft program and curriculum receive positive support from **TJU** and **ECUST** staff responsible for education.
August 2018	First version of Master Program Syllabus submitted to **IAB** for comments and feedback
September 2018	Feedback from **IAB** received.
October 2018	PAU Meeting 2; definition of the final syllabus.
November 2018	Apply for adding to-be-established BBChina courses at **TJU** and **ECUST**
December 2018	**SCU** hands the application reports to the colleges. BBChina courses approved by the Graduate School of **TJU**; then, BBChina program and its Courses added as one Research Orientation and further submitted for online approval. **ECUST** approval at School Level.
January 2019	**SCU** approval at College Level. At PMU 2 the inclusion of new courses is proposed by **TJU** and approved as well as changes in the Courses list.
February 2019	Last Syllabus version available with new Courses
June 2019	Application of courses at **SCU** with inclusion in the University system.

Co-funded by the Erasmus+ Programme of the European Union

	The program curriculum is available at **TJU** for master students to select BBChina courses.
July 2019	The program curriculum is available at **ECUST** for master students to select BBChina courses.
September 2019	BBChina Master Program lessons start at **TJU**, **ECUST** and **SCU**.

The steps followed to align the procedure at **SCU** for the Academic Year 2020/21 are listed in the following table.

Date	Step
November 2019	**SCU** presents the updated Syllabus with additional courses
June 2020	Application of additional courses at **SCU** with inclusion in the University system.
July 2020	Feedback from **SCU** offices: include in the BBChina Master Program two already existing courses instead of the proposed ones.

The updated syllabus was submitted at **SCU** for approval in November 2019 and the new courses submitted for inclusion in June 2020. After examining the request, the **SCU** offices replied that the syllabus of these new courses is quite similar with the already running courses "Combustion Explosion Theory" (Ref.Code M0817Z201) and "Treatment and management of solid waste" (Ref.Code M08300205). Therefore, the Offices did not consider necessary to set the proposed new courses and then included in the offer the already running courses instead of the new ones.

Therefore, for the Academic Year 2020/21, the educational offer for the BBChina Master Program is homogeneous all across the three Chinese HEIs, except for **SCU**, where the course "Combustion Explosion Theory" is available instead of the BBChina implemented course "Combustion", and "Treatment and management of solid waste" is available instead of the BBChina implemented course "Thermal Waste management and WtE technologies".

Co-funded by the Erasmus+ Programme of the European Union

7 BBChina and the Accreditation Process at National Level

The BBChina program adds a new research orientation under the existent second-level discipline (such as Environmental Engineering, Thermal Engineering), so it does not need the accreditation by the national level (Ministry of Education). For the sake of clarity, the "Second-level discipline" is what in terms of the BBChina general Syllabus presented at the beginning of this document a "*Master Degree in*" is, and the "*research orientation*" is the "Program in".

In China, the university independently sets the second-level disciplines and awards the related degree (such as Environmental Engineering, Thermal Engineering, etc.).

The functional departments of the Ministry of Education will compile those disciplines that have been set by a certain number of degree-granting units and widely recognized by the society, and have trained large-scale students, into the Disciplines Catalogue. The second-level disciplines catalogue is updated every five years and the first-level disciplines catalogue is updated every ten years. To set up a new second-level discipline, it requires a relatively independent professional knowledge system, and the university should have a team of teachers with a reasonable knowledge structure, age structure and professional technical position structure, which can provide a series of courses, research projects, required for the training of graduate students.

Therefore, it usually takes long time to set up a new second-level discipline, and get accreditation by the Ministry of Education via the Catalogue.

Co-funded by the Erasmus+ Programme of the European Union

In particular, regarding the involved Chinese Universities:

- at **TJU** the last new version of the catalogue was published, after the approval process, in January 2019; the next update is foreseen in 2024;
- at **ECUST** the last catalogue update was in 2014; the next one was expected in 2020 but it has been delayed to 2021, due to the COVID-19 Pandemic;
- at **SCU** the last update of the second-level discipline catalogue was published in 2018, and the next update is thus foreseen in 2023.

7.1 Rules and legislation for accreditation in China

According to the "**Subject catalogue setting and management method for degree awarding and personnel trainings**" issued by State Council Academic Degrees Committee and Ministry of Education of the People's Republic of China on Feb.25, 2009, the subject catalogue is divided into subjects (such as Engineering, Science, Philosophy etc.), first-level disciplines (for example, Environmental Science and Engineering) and second-level disciplines (for example, Environmental Science, Environmental Engineering, etc.). The adjustment of the first-level disciplines is **carried out every 10 years**. The procedure is as follows.

1. A certain number of degree-granting units or relevant state departments shall propose an adjustment motion and submit an argumentation report in accordance with the provisions of Article 7 of this Method;
2. The relevant disciplinary review committee of the Academic Degrees Committee of the State Council reviews the adjustment motion and the argumentation report and gives comments;
3. **The Office of the Academic Degrees Committee of the State Council proposes an adjustment plan** based on the argumentation report and the expert review opinions;

Co-funded by the Erasmus+ Programme of the European Union

4. The Office of the Academic Degrees Committee of the State Council will again seek the degree-granting units and experts' opinions;
5. After being approved by the Academic Degrees Committee of the State Council and approved by the Ministry of Education, it will be compiled into a catalogue of first-level disciplines.

The second-level disciplines for granting master's degree shall, in principle, **be set and adjusted independently by the degree-granting unit** (such as Tongji University) in accordance with the subject catalogue issued by the Academic Degrees Committee of the State Council and the Ministry of Education. The second-level disciplines catalogue **is compiled every five years**. On the basis of statistical analysis of the enrolment, degree awarding and employment of graduates of the existing second-level disciplines, **the relevant functional departments of the Ministry of Education will compile** those disciplines that have been set by a certain number of degree-granting units and widely recognized by the society, and have trained large-scale students, into second-level disciplines catalogue. To establish new second-level discipline that is not included in the catalogue, the degree-granting units shall propose the setup plan for the second-level discipline, and conduct necessary and feasibility argumentation. Under the same first-level disciplines, no more than 2 second-level disciplines can be added by the degree-granting units. The requirements to set up a new second-level discipline are as follows.

1. It has a similar theoretical basis to other second-level disciplines under the first-level discipline, or different aspects of the subject of the first-level discipline.
2. The second-level disciplines must **have a relatively independent professional knowledge system**, and some clear research directions have been formed.
3. The society must have a certain amount of talent demand for the second-level discipline.

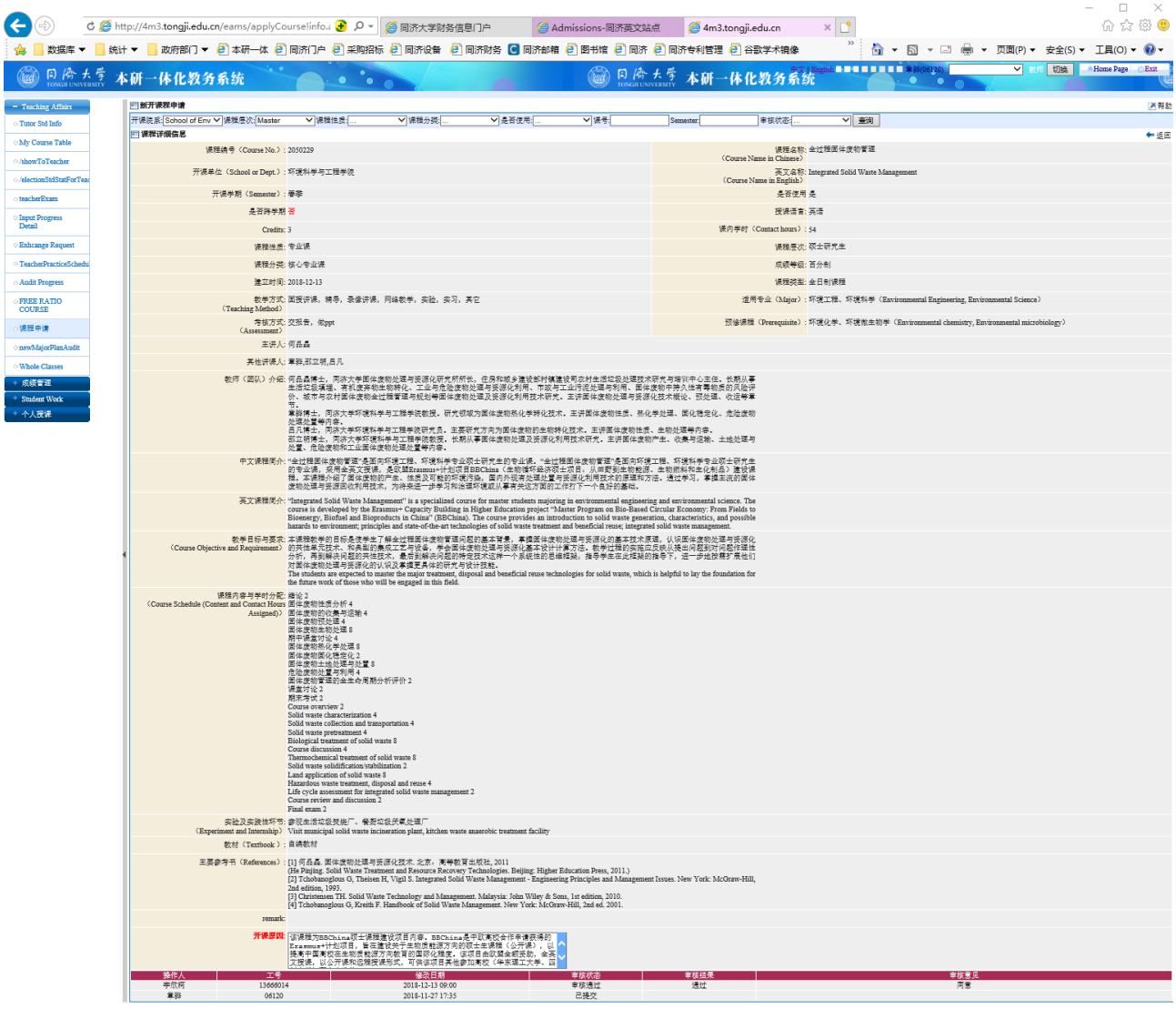
4. The degree-granting unit shall have the discipline foundation and talent training conditions necessary for setting up the second-level discipline, and **have a team of teachers with a reasonable knowledge structure, age structure and professional technical position structure, which can provide a series of courses required for the training of graduate students**.

Co-funded by the Erasmus+ Programme of the European Union

BBChina
Master Program
on Bio-Based Circular Economy

Master Program Approval Procedure at Tongji University (TJU)

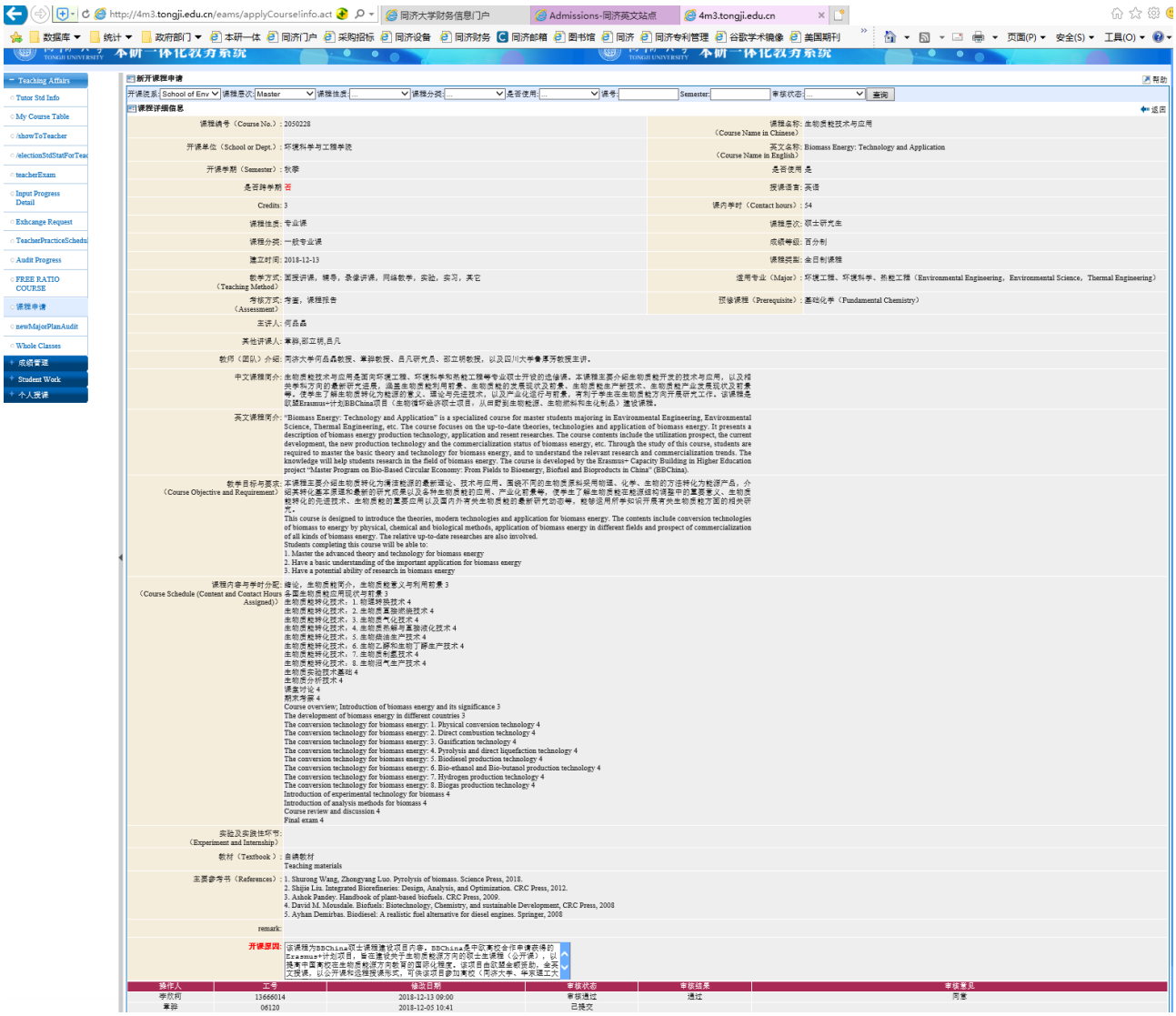
1) June 2018: Introduce BBChina program and curriculum framework to the Head of Department of Environmental Engineering, and the Deputy Dean of College of Environmental Science and Engineering, who is responsible for education. Positive supports were obtained.
2) November to December 2018: Apply for adding to-be-established BBChina courses (such as Integrated Solid Waste Management, Biomass Energy: Technology and Application, Bioreactor Engineering, Bioenergy Process Engineering, Renewable Energy Technologies, Life Cycle Assessment etc.) into TJU Course System, besides those already established ones such as Wastewater Treatment Theory and Technology, Thermal Waste management and WtE technologies, Combustion.



Co-funded by the Erasmus+ Programme of the European Union

BBChina

Master Program
on Bio-Based Circular Economy



新开课程申请

课程编号（Course No.）：2050228

课程名称（Course Name in Chinese）：生物质能技术与应用

开课单位（School or Dept.）：环境科学与工程学院

英文名称（Course Name in English）：Biomass Energy: Technology and Application

开课学期（Semester）：秋季

是否使用：是

是否跨学期：否

授课语言：英语

Credits: 3

课内学时（Contact hours）：54

课程性质：专业课

课程层次：硕士研究生

课程分类：一般专业课

成绩等级：百分制

建立时间：2018-12-13

课程类型：全日制课程

教学方式（Teaching Method）：面授讲课，辅导，录像讲课，网络教学，实验，实习，其它

适用专业（Major）：环境工程、环境科学、热能工程（Environmental Engineering，Environmental Science，Thermal Engineering）

考核方式（Assessment）：考查，课程报告

预修课程（Prerequisite）：基础化学（Fundamental Chemistry）

主讲人：何品晶

其他讲课人：章骅,邵立明,吕凡

教师（团队）介绍：同济大学何品晶教授、章骅教授、吕凡研究员、邵立明教授，以及四川大学鲁厚芳教授主讲。

中文课程简介：生物质能技术与应用是面向环境工程、环境科学和热能工程等专业硕士开设的选修课。本课程主要介绍生物质能开发的技术与应用，以及相关学科方向的最新研究进展，涵盖生物质能利用前景、生物质能的发展现状及前景、生物质能生产新技术、生物质能产业发展现状及前景等，使学生了解生物质转化为能源的意义、理论与先进技术，以及产业化运行与前景，有利于学生在生物质能方向开展研究工作。该课程是欧盟Erasmus+计划BBChina项目（生物循环经济联合项目：从田野到生物能源、生物燃料和生化制品）建设课程。

英文课程简介："Biomass Energy: Technology and Application" is a specialized course for master students majoring in Environmental Engineering, Environmental Science, Thermal Engineering, etc. The course focuses on the up-to-date theories, technologies and application of biomass energy. It presents a description of biomass energy production technology, application and resent researches. The course contents include the utilization prospect, the current development, the new production technology and the commercialization status of biomass energy, etc. Through the study of this course, students are required to master the basic theory and technology for biomass energy, and to understand the relevant research and commercialization trends. The knowledge will help students research in the field of biomass energy. The course is developed by the Erasmus+ Capacity Building in Higher Education project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina).

教学目标与要求（Course Objective and Requirement）：本课程主要介绍生物质转化为清洁能源的最新理论、技术与应用，围绕不同的生物质原料采用物理、化学、生物的方法转化为能源产品，介绍其转化基本原理和最新的研究成果以及各种生物质能的应用、产业化前景等，使学生了解生物质能在能源结构调整中的重要意义、生物质能转化的先进技术、生物质能的重要应用以及国内外有关生物质能的最新研究动态等，能够运用所学知识开展有关生物质能方面的相关研究。

This course is designed to introduce the theories, modern technologies and application for biomass energy. The contents include conversion technologies of biomass to energy by physical, chemical and biological methods, application of biomass energy in different fields and prospect of commercialization of all kinds of biomass energy. The relative up-to-date researches are also involved.

Students completing this course will be able to:

1. Master the advanced theory and technology for biomass energy
2. Have a basic understanding of the important application for biomass energy
3. Have a potential ability of research in biomass energy

课程内容与学时分配（Course Schedule (Content and Contact Hours Assigned)）：绪论，生物质概况介，生物质概念义与利用前景 3
各国生物质能应用现状与前景 3
生物质能转化技术：1. 物理转换技术 4
生物质能转化技术：2. 生物质直接燃烧技术 4
生物质能转化技术：3. 生物质气化技术 4
生物质能转化技术：4. 生物质热解与直接液化技术 4
生物质能转化技术：5. 生物燃油生产技术 4
生物质能转化技术：6. 生物乙醇和生物丁醇生产技术 4
生物质能转化技术：7. 生物质制柴技术 4
生物质能转化技术：8. 生物沼气生产技术 4
生物质实验技术基础 4
生物质分析技术 4
课堂讨论 4
期末考察 4
Course overview; Introduction of biomass energy and its significance 3
The development of biomass energy in different countries 3
The conversion technology for biomass energy: 1. Physical conversion technology 4
The conversion technology for biomass energy: 2. Direct combustion technology 4
The conversion technology for biomass energy: 3. Gasification technology 4
The conversion technology for biomass energy: 4. Pyrolysis and direct liquefaction technology 4
The conversion technology for biomass energy: 5. Biodiesel production technology 4
The conversion technology for biomass energy: 6. Bio-ethanol and Bio-butanol production technology 4
The conversion technology for biomass energy: 7. Hydrogen production technology 4
The conversion technology for biomass energy: 8. Biogas production technology 4
Introduction of experimental technology for biomass 4
Introduction of analysis methods for biomass 4
Course review and discussion 4
Final exam 4

实验及实践性环节（Experiment and Internship）：

教材（Textbook）：自编教材
Teaching materials

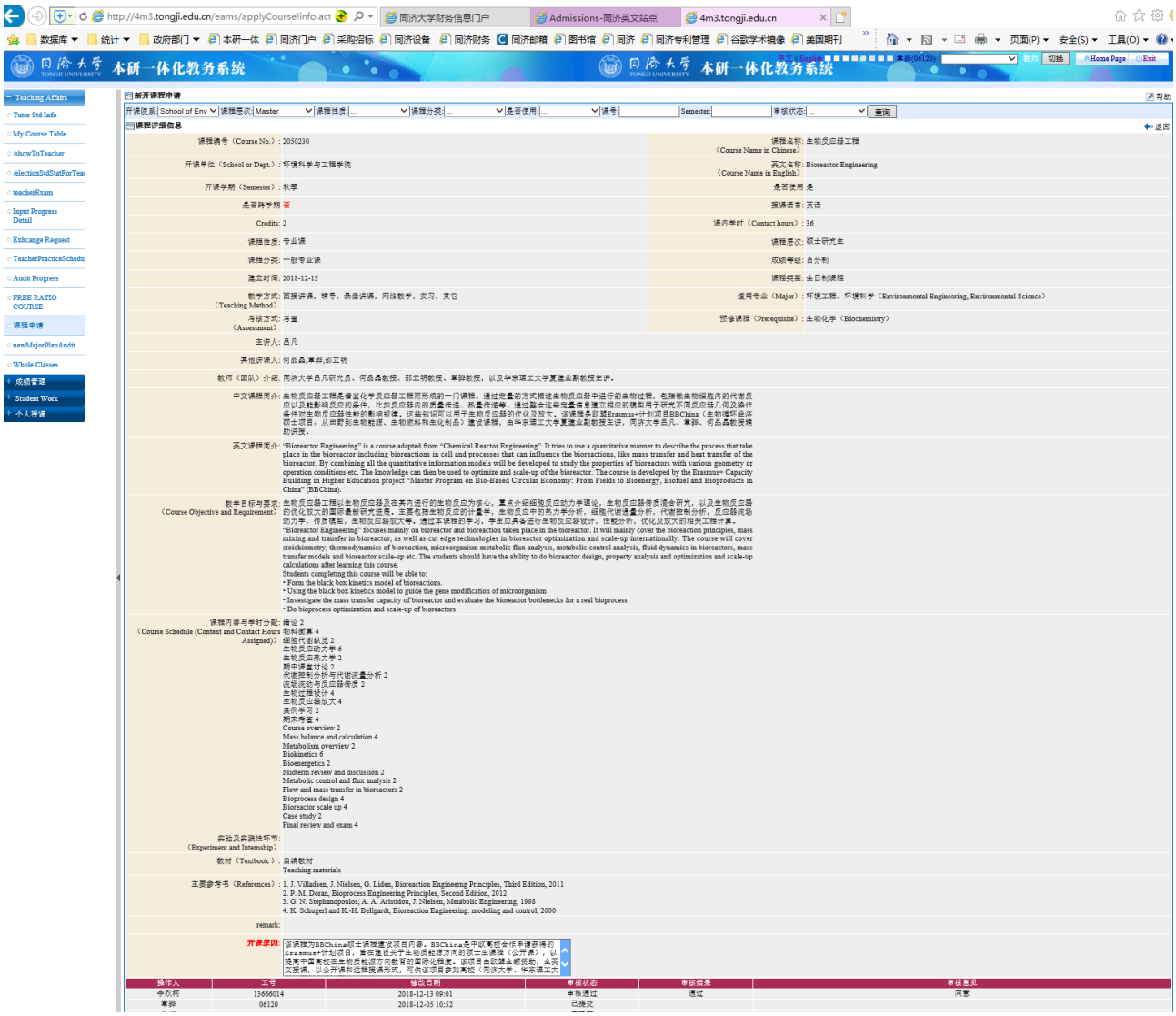
主要参考书（References）：1. Shurong Wang, Zhongyang Luo. Pyrolysis of biomass. Science Press, 2018.
2. Shijie Liu. Integrated Biorefineries: Design, Analysis, and Optimization. CRC Press, 2012.
3. Ashok Pandey. Handbook of plant-based biofuels. CRC Press, 2009.
4. David M. Mousdale. Biofuels: Biotechnology, Chemistry, and sustainable Development, CRC Press, 2008
5. Ayhan Demirbas. Biodiesel: A realistic fuel alternative for diesel engines. Springer, 2008

remark：

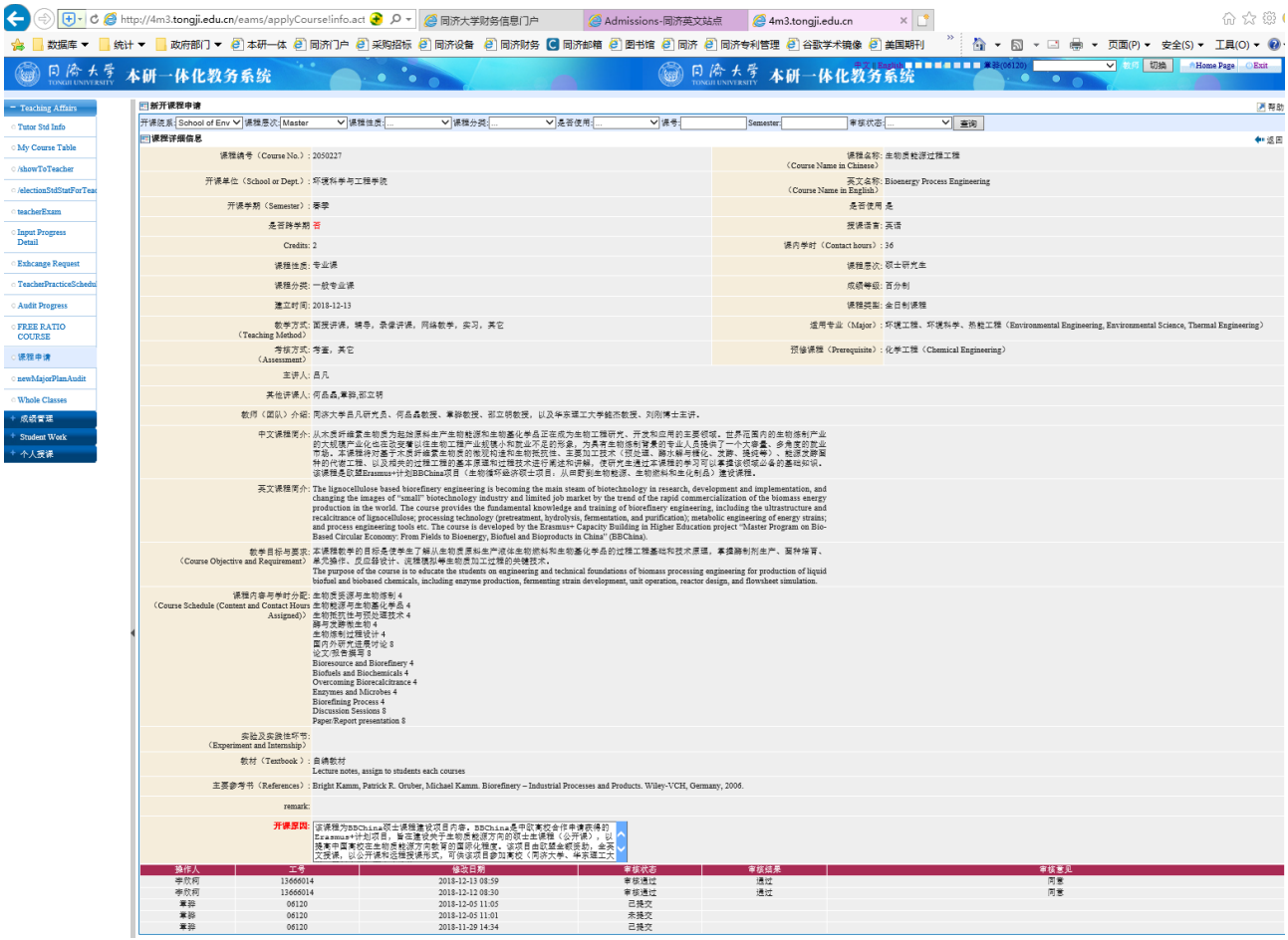
开课原因：该课程为BBChina硕士课程建设项目内容，BBChina是中欧高校合作申请获得的Erasmus+计划项目，旨在建设关于生物质能源方向的硕士生课程（公开课），以提高中国高校在生物质能源方向教育的国际化程度。该项目由欧盟全额资助，全英文授课，以公开课和远程授课形式，可供该项目参加高校（同济大学、华东理工大

操作人	工号	修改日期	审核状态	审核结果	审核意见
学院初	13666014	2018-12-13 09:00	审核通过	通过	同意
章骅	06120	2018-12-05 10:41	已提交		

Co-funded by the Erasmus+ Programme of the European Union



Co-funded by the Erasmus+ Programme of the European Union



Co-funded by the Erasmus+ Programme of the European Union

3) December 18, 2018: The applications for adding to-be-established BBChina courses were all approved by the Graduate School of TJU.

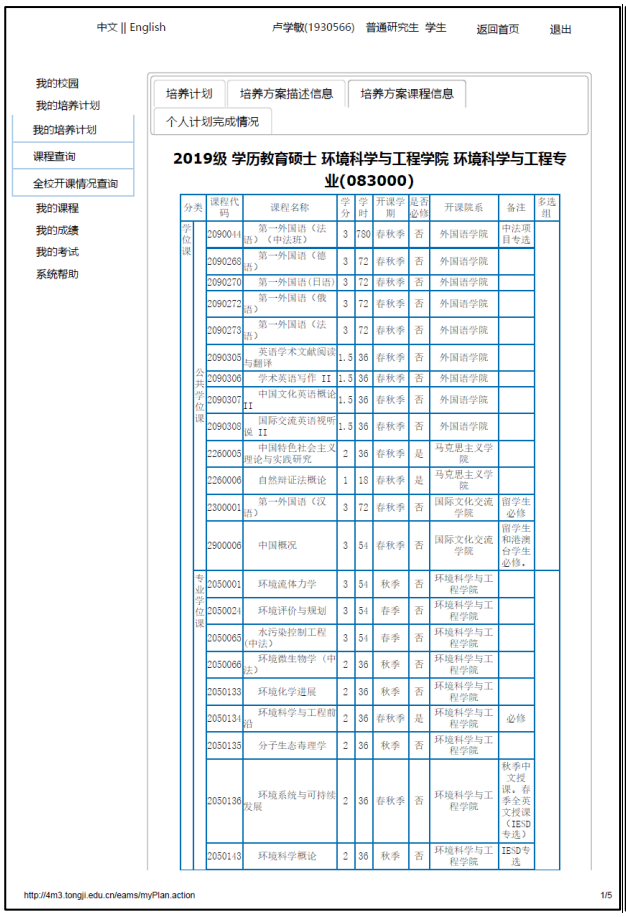
4) December 20, 2018: The 2019 education program for Academic master degree in Environmental Science and Engineering, as well as the 2019 education program for Professional master degree in Environmental Engineering were revised (including curriculum), in which BBChina program was added as one Research Orientation, and BBChina courses were added. They were submitted to the college and then to the Graduate School of TJU for online approval.

5) June, 2019: The education program for Academic master degree in Environmental Science and Engineering, as well as the education program for Professional master degree in Environmental

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

Engineering were approved by the college (Deputy Dean who is responsible for education) and the Graduate School of TJU. The program/curriculum is then available for master students to select BBChina courses. The following webpages shows the courses that can be seen and selected in the student study plan system.



中文 || English　　卢学敏(1930566)　普通研究生 学生　　返回首页　　退出

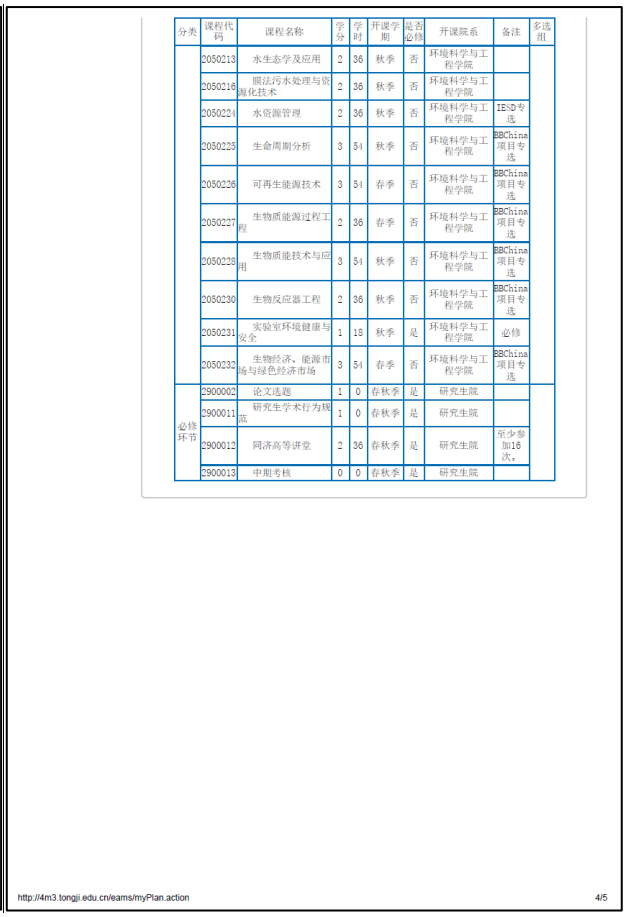
我的校园
我的培养计划
我的培养计划
课程查询
全校开课情况查询
我的课程
我的成绩
我的考试
系统帮助

培养计划　培养方案描述信息　培养方案课程信息
个人计划完成情况

2019级 学历教育硕士 环境科学与工程学院 环境科学与工程专业(083000)

分类	课程代码	课程名称	学分	学时	开课学期	是否必修	开课院系	备注	多选组
学位课	2090044	第一外国语（法语）（中法班）	3	780	春秋季	否	外国语学院	中法项目专选	
公共学位课	2090268	第一外国语（德语）	3	72	春秋季	否	外国语学院		
	2090270	第一外国语（日语）	3	72	春秋季	否	外国语学院		
	2090272	第一外国语（俄语）	3	72	春秋季	否	外国语学院		
	2090273	第一外国语（法语）	3	72	春秋季	否	外国语学院		
	2090305	英语学术文献阅读与翻译	1.5	36	春秋季	否	外国语学院		
	2090306	学术英语写作 II	1.5	36	春秋季	否	外国语学院		
	2090307	中国文化英语概论II	1.5	36	春秋季	否	外国语学院		
	2090308	国际交流英语视听说 II	1.5	36	春秋季	否	外国语学院		
	2260005	中国特色社会主义理论与实践研究	2	36	春秋季	是	马克思主义学院		
	2260006	自然辩证法概论	1	18	春秋季	是	马克思主义学院		
	2300001	第一外国语（汉语）	3	72	春秋季	否	国际文化交流学院	留学生必修	
	2900006	中国概况	3	54	春秋季	否	国际文化交流学院	留学生和港澳台学生必修。	
专业学位课	2050001	环境流体力学	3	54	秋季	否	环境科学与工程学院		
	2050024	环境评价与规划	3	54	春季	否	环境科学与工程学院		
	2050065	水污染控制工程(中法)	3	54	春季	否	环境科学与工程学院		
	2050066	环境微生物学（中法）	2	36	秋季	否	环境科学与工程学院		
	2050133	环境化学进展	2	36	秋季	否	环境科学与工程学院		
	2050134	环境科学与工程前沿	2	36	春秋季	是	环境科学与工程学院	必修	
	2050135	分子生态毒理学	2	36	秋季	否	环境科学与工程学院		
	2050136	环境系统与可持续发展	2	36	春秋季	否	环境科学与工程学院	秋季中文授课，春季全英文授课（IEND专选）	
	2050143	环境科学概论	2	36	秋季	否	环境科学与工程学院	IEND专选	

http://4m3.tongji.edu.cn/eams/myPlan.action　1/5



分类	课程代码	课程名称	学分	学时	开课学期	是否必修	开课院系	备注	多选组
	2050213	水生态学及应用	2	36	秋季	否	环境科学与工程学院		
	2050216	膜法污水处理与资源化技术	2	36	秋季	否	环境科学与工程学院		
	2050224	水资源管理	2	36	秋季	否	环境科学与工程学院	IEND专选	
	2050225	生命周期分析	3	54	秋季	否	环境科学与工程学院	BBChina项目专选	
	2050226	可再生能源技术	3	54	春季	否	环境科学与工程学院	BBChina项目专选	
	2050227	生物质能源过程工程	2	36	春季	否	环境科学与工程学院	BBChina项目专选	
	2050228	生物质能技术与应用	3	54	秋季	否	环境科学与工程学院	BBChina项目专选	
	2050230	生物反应器工程	2	36	秋季	否	环境科学与工程学院	BBChina项目专选	
	2050231	实验室环境健康与安全	1	18	秋季	是	环境科学与工程学院	必修	
	2050232	生物经济、能源市场与绿色经济市场	3	54	春季	否	环境科学与工程学院	BBChina项目专选	
必修环节	2900002	论文选题	1	0	春秋季	是	研究生院		
	2900011	研究生学术行为规范	1	0	春秋季	是	研究生院		
	2900012	同济高等讲堂	2	36	春秋季	是	研究生院	至少参加16次。	
	2900013	中期考核	0	0	春秋季	是	研究生院		

http://4m3.tongji.edu.cn/eams/myPlan.action　4/5

Evidence of the Implementation

- 2019 Education program for Professional master degree in Environmental Engineering
- 2019 Curriculum for Professional master degree in Environmental Engineering
- 2019 Education program for Academic master degree in Environmental Science and Engineering
- 2019 Curriculum for Academic master degree in Environmental Science and Engineering

Co-funded by the Erasmus+ Programme of the European Union

The above 4 files can be downloaded from the educational management information system for both master student and staffs (http://yjsxt.tongji.edu.cn, available only for TJU students and staffs).

Co-funded by the Erasmus+ Programme of the European Union

College of Environmental Science and Engineering 2019 Grade--Basic Information

I.Brief Introduction

The College of Environmental Science and Engineering of Tongji University is supported by teaching and research platforms consisted of the State Key Laboratory of Pollution Control and Resource Reuse(founded in 1989), the National Engineering Research Center of Urban Pollution Control (established in 1995), the UNEP-Tongji Institute of Environment for Sustainable Development (established in 2002) etc. As one of the top-ranked majors in Tongji University, Environmental Science and Engineering has recently been listed as the A+ discipline in the whole nation and has received both National and State support for continues development.

The College is one of the earliest to be qualified to award Master and Doctoral Degree in Environmental Science and Environmental Engineering in 1981 and 1984, respectively. It is also the first to establish post-doctoral research station in 1985. In 2000, the college was granted the right to award Doctoral Degree of Environmental Science and Engineering. Currently, there are 114 faculty members in the college, including 4 Academicians, 63 full professors and 36 associate professors.

As an interdisciplinary field in science and engineering, Environmental Science and Engineering aims to solve environmental pollutions, ecological damages in China, and to satisfy the demands of social and economic sustainable development. It mainly focuses on understanding the fate and transport of pollutants in the environment; investigating the adverse effects and the mechanisms of toxicity by pollutants to the environment and human health; technology and theory of pollution treatment and control; the harmonious coexistence of human and nature; environmental management and planning; environmental impact assessment; and environmental economics, etc. Environmental Science and Engineering has domestic and international academic influences for its productive researches. From 2006 to 2012, the College has completed several national, provincial and ministerial projects. Moreover, it published more than 10 monographs and textbooks and was awarded 10 awards by the State, Shanghai government, Science and Technology Ministry and Education Ministry.

The College of Environmental Science and Engineering aims to establish a base for the cultivation of worldwide famous environmental science and engineering specialists and researches. By carrying out projects in National Natural Science Foundation, State 12th Five-year Technology Support Plan, 863 High-Tech Plan and international collaboration, the College provides advanced theories and techniques to urban environmental protections and socio-economy sustainable development, especially in the fields of advanced detection techniques for contaminants, ecological remediation for polluted environment, research and development on water treatment chemicals, water quality safety and ecological changes in the Yangtze River Basin, ecological toxicity and ecological risk, modern molecular biotechnology, and Environmental Management and Sustainable Development.

The College of Environmental Science and Engineering enhanced its teaching quality, modified its laboratory and 985-platform construction, reformed its curriculum and imported advanced teaching methods, all in all to train the senior talents, who owns solid foundation in the basic theory of environment protection, understand the regional and global environment issues in-depth and able to solve these problems using technology and management.

After completing all required courses, students are awarded master’s degree of Environmental Science and Engineering.

II.Objectives

The program aims at training builders and successors of socialism with Chinese characteristics for a new era who

1. Pursue the correct political orientation, have a sense of patriotism, and uphold the leadership of the Communist Party of China; learn Marxism, Mao Zedong Thought, Deng Xiaoping Theory, Thought of Three Represents, Scientific Outlook on Development and Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era; serve the people and the country; abide by the laws with self-discipline and moral character;

2. Seek the truth from facts, and dare to explore and innovate with a global perspective;

3.Full-time masters with professional degree of environmental engineering are required to have solid knowledge foundation, comprehensive quality, practical ability, and a certain ability to innovate. They are trained to be the talents who are needed by social service applications, or master complex high-level engineering technology and engineering management. Specific requirements are as followed:

4.Master the basic theory, advanced technology methods and means in environmental engineering field, have the ability of engineering design and operation, analysis and integration, research and development, management and decision-making independently in some direction of the field.

5.Master a foreign language.

6.To be physically and mentally healthy.

III.Research Orientations

1.Urban pollution control and storm water management
2.Regional Aquatic Environment Management
3.Water Pollution Control Theory and Technology
4.Solid Waste Treatment and Resource Recovery
5.Air Pollution Control and Source Reduction
6.Energy and Materials
7.Contaminated site remediation
8.Water supply theory and technology
9.Water Treatment Theory and Technology and pipe network optimization
10.Water supply and drainage in buildings, theory and technology
11.Environmental pollution chemistry and ecology
12.Environmental planning and management
13.Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China (BBChina)

IV.Program Duration

The standard duration is 2.5 years with an option of extending it to four years maximum.

V.Credit

1. Students should complete at least 34 credits, with no fewer than 7 credits for common degree courses, no fewer than 9 for professional degree courses, no fewer than 8 for non-degree courses, and 10 for compulsory courses. All credits are earned by passing the examinations organized by the program after which dissertations can be written.

2. In non-degree courses, two credits must be completed for one cross-disciplinary or cross-faculty course.

3. One undergraduate professional fundamental course can be selected as a non-credit supplementary course.

VI.Thesis-writing

Academic master's degree thesis is an important part of postgraduate training, and a major means to cultivate postgraduates' innovative ability. The general procedures for the work of academic dissertations are literature reading and research, topic selection of papers, scientific research, writing papers and thesis defense.
These include topic selection, Interim evaluation, Anonymous review and dissertation defense.
1. Topic selection
The topic for research should be finalized within 1 to 1 and half years since entrance. During this time, besides taking required courses, the candidate should perform literature review, understand the latest research trend under the supervision of their advisors. The research topics and content should also follow the requirements of Training Instructions of Tongji University Full-time Professional Degree Education (TJU Graduate [2016] NO. 74)
The topic selection process also requires an oral presentation followed by assessment of a research committee based on the sub-disciplines, consisted of 3-5 faculty members of the College. The candidates will be awarded 1 credit after passing the topic selection step. The candidates get two opportunities to pass the topic selection presentation. If failed, the candidates will be disqualified from the program.
2. Interim evaluation
The interim valuation will take place at the 3rd semester of the program.
Requirements: finish all required courses and passed the topic selection presentation. Mid-term evaluation will be performed by a Research Committee, consisted of not less than 5 faculty members. The candidates also get two opportunities to pass the mid-term evaluation, otherwise will be disqualified from the program.
3. Anonymous review
The thesis will be subjected for anonymous review according to Training Instructions of Tongji University Full-time Professional Degree Education(TJU Graduate [2016] NO. 74) . Degree thesis concerning academic secret will be administrated in accordance with the Interim Provisions of Application for Master Degree with thesis Concerning Academic Secret of Tongji University.
4. Dissertation defense
After thesis writing and blind review, the candidates can apply for thesis defense. Research Committee consisted of not less than 5 faculty members will granted pass or fail based on the overall quality of the thesis and research work performed by the candidates. Thesis work should be completed according to the Training Instructions of Tongji University Full-time Professional Degree Education (TJU Graduate [2016] NO. 74) .

VII.Remark

1. Courses are offered in Year 1-1.5. The Professional Ethics Course included in the compulsory courses must be completed before the interim evaluation.
2. The interval between thesis topic selection and interim evaluation should be at least two months, and that between interim evaluation and dissertation defense, at least six months.
3. The Professional Ethics Course is a regular high-level academic lecture series organized by the graduate school, faculties and departments. Students are required to attend no fewer than 16 lectures before interim evaluation and upload their reflection into the postgraduate management information system.
4. Professional practice is usually done at the end of the course study spanning 0.5-1 academic year, and should be consistent with the dissertation topic.
5. Please refer to the Training Instructions of Tongji University Full-time Professional Degree Education if the program training and dissertation defense are completed earlier than planned.

Annex I

College of Environmental Science and Engineering 2019 Grade--curriculum of training programme

Course Type	Course Number	Course Name	Department	Credits	Hours	Season	compulsory/ elective	Checkbox
Common Courses	2020578	Engineering Ethics	College of Civil Engineering	2	36	spring and autumn	compulsory	
	2090044	First Foreign Language(French)	School of Foreign Languages	3	780	spring and autumn	compulsory	
	2090267	English for Postgraduates	School of Foreign Languages	3	72	spring and autumn	compulsory	
	2090268	German as Foreign Language	School of Foreign Languages	3	72	spring and autumn	compulsory	
	2090270	First Foreign Language(Japanese)	School of Foreign Languages	3	72	spring and autumn	compulsory	
	2090272	First Foreign Language(Russian)	School of Foreign Languages	3	72	spring and autumn	compulsory	
	2090273	First Foreign Language (French)	School of Foreign Languages	3	72	spring and autumn	compulsory	
	2090305	Literature Reading and Translation	School of Foreign Languages	1.5	36	spring and autumn	elective	
	2090306	Academic English Writing II	School of Foreign Languages	1.5	36	spring and autumn	elective	
	2090307	Seminar on Chinese Culture in the New Era II	School of Foreign Languages	1.5	36	spring and autumn	elective	
	2090308	Listening, Speaking and Critical Thinking II	School of Foreign Languages	1.5	36	spring and autumn	elective	
	2260005	Research on the Theory and Practice of Socialism with Chinese Characteristics	School of Marxism	2	36	spring and autumn	compulsory	
	2300001	Chinese Language	International School	3	72	spring and autumn	elective	
	2900006	A General View of China	International School	3	54	spring and autumn	elective	
Core Courses	2050001	Environmental Fluid Mechanics	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050006	New Technology of Water Supply and Sewage Drainage for High-rise Buildings	College of Environmental Science and Engineering	3	54	spring	elective	
	2050007	Methods of optimization	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050012	Microbial Physiology Principle	College of Environmental Science and Engineering	3	54	spring	elective	

Core Courses	2050065	Water Pollution Control Engineering	College of Environmental Science and Engineering	3	54	spring	elective	
	2050066	Environmental Microbiology (Sino-French Cooperation)	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050068	Technology and Engineering of Waste Water Treatment	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050134	Frontier in Environmental Science and Engineering	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050136	Environmental System and Sustainable Development	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050143	Environmental Dimensions of Sustainable Development	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050147	Sustainable Development: Institutions and Policies	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050149	Atmospheric Science and Climate Change	College of Environmental Science and Engineering	2	36	spring	elective	
	2050155	Wastewater Treatment:Theory and Technology	College of Environmental Science and Engineering	3	54	spring	elective	
	2050156	Solid Waste Treatment and Resource Reuse	College of Environmental Science and Engineering	3	54	spring	elective	
	2050157	Air Pollution Control Engineering	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050158	Solid Waste Treatment and Resource Reuse (IFCIM)	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050159	Specialty Foreign Language (IFCIM)	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050168	Frontier of Environmental Science and Technology (IFCIM)	College of Environmental Science and Engineering	2	36	spring	elective	
	2050174	The Experiment of Instrumental Analysis (Spectrum Analysis)	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050175	The Experiment of Chromatography Analysis	College of Environmental Science and Engineering	2	36	spring and autumn	elective	

Core Courses	2050176	The Experiment of Equipment Analysis (Biological Analysis)	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050186	Integrated Solid Waste Management	College of Environmental Science and Engineering	2	36	spring	elective	
	2050188	Wastewater Treatment	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050189	Water supply: Principles and Technology	College of Environmental Science and Engineering	2	36	spring	elective	
	2050197	Theory and technology of water treatment	College of Environmental Science and Engineering	2	36	spring	elective	
	2050199	Ecological Economy	College of Environmental Science and Engineering	2	36	spring	elective	
	2050200	Ecosystem Management	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050201	Environmental Instrumental Analysis	College of Environmental Science and Engineering	2	36	spring and autumn	compulsory	
	2050214	Advanced water chemistry	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050215	Frontier in Municipal Engineering	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050229	Integrated Solid Waste Management	College of Environmental Science and Engineering	3	54	spring	elective	
	2102002	Numerical Analysis	School of Mathematical Sciences	3	54	spring and autumn	elective	
Elective Courses	2050002	Theory of Water Supply and Sewage Treatment	College of Environmental Science and Engineering	3	54	spring	elective	
	2050005	Cost Analysis in Water Supply and Sewage Engineering	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050009	Advanced drinking water treatment	College of Environmental Science and Engineering	2	36	spring	elective	
	2050011	Colloid Chemistry and Coagulation Process	College of Environmental Science and Engineering	2	36	autumn	elective	

Elective Courses	2050024	Environmental Assessment & Planning	College of Environmental Science and Engineering	3	54	spring	elective	
	2050052	Solid Waste Treatment and Resource Recovery	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050054	Urban Hydrology and Municipal Waste Water Treatment	College of Environmental Science and Engineering	2	44	spring	elective	
	2050055	Management and treatment of water	College of Environmental Science and Engineering	3	58	spring	elective	
	2050058	Solid Remediation	College of Environmental Science and Engineering	2	30	spring	elective	
	2050059	Resource Management and Models	College of Environmental Science and Engineering	3	60	autumn	elective	
	2050060	Monitoring and analysis of sources of pollutants	College of Environmental Science and Engineering	3	60	autumn	elective	
	2050061	Odor and Flue Gas Treatment	College of Environmental Science and Engineering	2	30	spring	elective	
	2050062	Environmental Economics	College of Environmental Science and Engineering	3	60	autumn	elective	
	2050087	Systemic Planning of Regional Water Pollution Control	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050098	Sludge Treatment Engineering	College of Environmental Science and Engineering	2	36	spring	elective	
	2050101	Data Management and Experimental Design	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050135	Molecular Ecotoxicology	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050138	Modern Environmental Biology	College of Environmental Science and Engineering	2	36	spring	elective	
	2050141	Environmental Ethics	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050150	Environmental Informatics	College of Environmental Science and Engineering	2	36	spring	elective	

Elective Courses	2050154	Advanced Oxidation Process	College of Environmental Science and Engineering	2	36	spring	elective	
	2050161	Water Treatment Instrument and Control System	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050177	Numerical simulation of fluid flow and heat/mass transfer	College of Environmental Science and Engineering	3	54	spring	elective	
	2050191	Aquatic environmental chemistry	College of Environmental Science and Engineering	2	36	spring	elective	
	2050194	Environmental Molecular Microbiology	College of Environmental Science and Engineering	2	36	spring	elective	
	2050196	Environmental Systems Analysis	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050202	Ecological and Health Risk Assessment	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050203	Design and Optimization of Biological Wastewater Treatment	College of Environmental Science and Engineering	3	54	spring	elective	
	2050206	Principle and application of modern biotechnology	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050207	Environmental Nano Science and Engineering	College of Environmental Science and Engineering	2	36	spring	elective	
	2050209	Principles and Application of Aquatic Chemistry	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050210	Common Experiment Principles and Step-by-step Data Processing	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050211	Literature Search and Scientific Writing	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050213	Water ecology and its application	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050216	Membrane technology for wastewater treatment and resource	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050217	Biological stability of drinking water distribution systems	College of Environmental Science and Engineering	2	36	spring	elective	

Elective Courses	2050218	Scientific reading and writing	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050219	Water Disinfection	College of Environmental Science and Engineering	2	36	spring	elective	
	2050224	water resources management	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050225	Life Cycle Assessment	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050226	Renewable Energy Technologies	College of Environmental Science and Engineering	3	54	spring	elective	
	2050227	Bioenergy Process Engineering	College of Environmental Science and Engineering	2	36	spring	elective	
	2050228	Biomass Energy: Technology and Application	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050230	Bioreactor Engineering	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050231	Laboratory Environmental Health and Safety	College of Environmental Science and Engineering	1	18	autumn	compulsory	
	2050232	Bioeconomy, Energy Market and Green Market	College of Environmental Science and Engineering	3	54	spring	elective	
	2240001	Intellectual property rights	Law School	2	36	spring and autumn	elective	
Compulsories	2900007	Full-time specialized field practice		6	0	spring and autumn	compulsory	
	2900011	Code of Academic Integrity		1	0	spring and autumn	compulsory	
	2900012	Tongji University Advanced Lectures for Graduate Students		2	36	spring and autumn	compulsory	
	2900013	Interim Assessment		0	0	spring and autumn	compulsory	
	2900016	Thesis Proposal		1	0	spring and autumn	compulsory	

College of Environmental Science and Engineering 2019 Grade--Basic Information

I.Brief Introduction

The College of Environmental Science and Engineering of Tongji University is supported by teaching and research platforms consisted of the State Key Laboratory of Pollution Control and Resource Reuse (founded in 1989), the National Engineering Research Center of Urban Pollution Control (established in 1995), the UNEP-Tongji Institute of Environment for Sustainable Development (established in 2002) etc. As one of the top-ranked majors in Tongji University, Environmental Science and Engineering has recently been listed as the A+ discipline in the whole nation and has received both National and State support for continues development.

The College is one of the earliest to be qualified to award Master and Doctoral Degree in Environmental Science and Environmental Engineering in 1981 and 1983, respectively. It is also the first to establish post-doctoral research station in 1985. In 2000, the college was granted the right to award Doctoral Degree of Environmental Science and Engineering. Currently, there are 93 faculty members in the college, including 4 Academicians, 51 full professors and 28 associate professors.

As an interdisciplinary field in science and engineering, Environmental Science and Engineering aims to solve environmental pollutions, ecological damages in China, and to satisfy the demands of social and economic sustainable development. It mainly focuses on understanding the fate and transport of pollutants in the environment; investigating the adverse effects and the mechanisms of toxicity by pollutants to the environment and human health; technology and theory of pollution treatment and control; the harmonious coexistence of human and nature; environmental management and planning; environmental impact assessment; and environmental economics, etc. Environmental Science and Engineering has domestic and international academic influences for its productive researches. From 2006 to 2012, the College has completed several national, provincial and ministerial projects. Moreover, it published more than 10 monographs and textbooks and was awarded 10 awards by the State, Shanghai government, Science and Technology Ministry and Education Ministry.

The College of Environmental Science and Engineering aims to establish a base for the cultivation of worldwide famous environmental science and engineering specialists and researches. By carrying out projects in National Natural Science Foundation, State 12th Five-year Technology Support Plan, 863 High-Tech Plan and international collaboration, the College provides advanced theories and techniques to urban environmental protections and socio-economy sustainable development, especially in the fields of advanced detection techniques for contaminants, ecological remediation for polluted environment, research and development on water treatment chemicals, water quality safety and ecological changes in the Yangtze River Basin, ecological toxicity and ecological risk, modern molecular biotechnology, and Environmental Management and Sustainable Development.

The College of Environmental Science and Engineering enhanced its teaching quality, modified its laboratory and 985-platform construction, reformed its curriculum and imported advanced teaching methods, all in all to train the senior talents, who owns solid foundation in the basic theory of environment protection, understand the regional and global environment issues in-depth and able to solve these problems using technology and management.

After completing all required courses, students are awarded master’s degree of Environmental Science and Engineering.

II.Objectives

The program aims at training builders and successors of socialism with Chinese characteristics for a new era who

1. Pursue the correct political orientation, have a sense of patriotism, and uphold the leadership of the Communist Party of China; learn Marxism, Mao Zedong Thought, Deng Xiaoping Theory, Thought of Three Represents, Scientific Outlook on Development and Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era; serve the people and the country; abide by the laws with self-discipline and moral character;
2. Seek the truth from facts, and dare to explore and innovate with a global perspective;
3.To develop the capacity to communicate and research in municipal engineering with English as well as keep up to date in the domain.
4.To develop innovation and creativity; to achieve academic accomplishments in Environmental Science and Engineering and to become expert in this area.
5.To have a good acquaintance with a foreign language and grasp the ability of writing research papers and academic communication; to develop a rigorous attitude on research and a strong team spirit.
6.To develop the ability of research make novel progress on municipal engineering or expertise. To become one of the elites in the municipal industry.
7.To be physically and mentally healthy.

III.Research Orientations

1.Environmental Chemistry and Biology
2.Environmental Processes and Remediation
3.Environmental Monitoring and Management
4.Environmental Toxicology and Health
5.Environmental Functional Materials
6.Environmental Planning and Management
7.Regional and Urban Water Management
8.Wastewater treatment and Resource Reuse
9.Solid Waste Treatment and Resource Recovery
10.Air Pollution Control: Theory and Technology
11.Environment and Energy
12.Soil Pollution Control and Remediation
13.Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China (BBChina)

IV.Program Duration

The standard duration is 2.5 years with an option of extending it to 4 years maximum.

V.Credit

1. Students should complete at least 30 credits, with 6 credits for common degree courses, 12 for professional degree courses, 8 for non-degree courses, and 4 for compulsory courses.
2. In non-degree courses, 2 credits must be completed for one cross-disciplinary or cross-faculty course.

VI.Thesis-writing

Academic master's degree thesis is an important part of postgraduate training, and a major means to cultivate postgraduates' innovative ability. The general procedures for the work of academic dissertations are literature reading and research, topic selection of papers, scientific research, writing papers and thesis defense.

These include topic selection, Interim evaluation, Anonymous review and dissertation defense.

1. Topic selection

The topic for research should be finalized within 1 to 1 and half years since entrance. During this time, besides taking required courses, the candidate should perform literature review, understand the latest research trend under the supervision of their advisors. The research topics and content should also follow the requirements of the Training Instructions of Tongji University Academic Degree Education (TJU Graduate 2017).

The topic selection process also requires an oral presentation followed by assessment of a research committee based on the sub-disciplines, consisted of 3-5 faculty members of the College. The candidates will be awarded 1 credit after passing the topic selection step. The candidates get two opportunities to pass the topic selection presentation. If failed, the candidates will be disqualified from the program.

2. Interim evaluation

The interim evaluation will take place at the 3rd semester of the program.

Requirements: finish all required courses and passed the topic selection presentation. Interim evaluation will be performed by a Research Committee, consisted of not less than 5 faculty members. The candidates also get two opportunities to pass the mid-term evaluation, otherwise will be disqualified from the program. Basic requirements for organizing and implementing the evaluation must be aligned with the Training Instructions of Tongji University Academic Degree Education (TJU Graduate 2017).

3. Anonymous review

The thesis will be subjected for anonymous review according to the Training Instructions of Tongji University Academic Degree Education (TJU Graduate 2017). Degree thesis concerning academic secret will be administrated in accordance with the Interim Provisions of Application for Master Degree with thesis Concerning Academic Secret of Tongji University.

4. Dissertation defense

After thesis writing and anonymous review, the candidates can apply for dissertation defense. Research Committee consisted of not less than 5 faculty members will granted pass or fail based on the overall quality of the thesis and research work performed by the candidates. Thesis work should be completed according to the Training Instructions of Tongji University Academic Degree Education (TJU Graduate [2016] NO. 74).

VII. Remark

1. Courses are offered in Year 1. The Academic and Professional Ethics Course included in the compulsory courses must be completed before the interim evaluation.
2. The interval between thesis topic selection and interim evaluation should be at least two months, and that between interim evaluation and dissertation defense, at least six months.
3. Please refer to the Training Instructions of Tongji University Academic Degree Education if the program training and dissertation defense are completed earlier than planned.
4. The Academic and Professional Ethics Course is a regular high-level academic lecture series organized by the graduate school, faculties and departments. Students are required to attend no fewer than 16 lectures before interim evaluation and upload their reflection into the postgraduate management information system.

College of Environmental Science and Engineering 2019 Grade--curriculum of training programme

Course Type	Course Number	Course Name	Department	Credits	Hours	Season	compulsory/ elective	Checkbox
Common Courses	2090044	First Foreign Language(French)	School of Foreign Languages	3	780	spring a nd autum n	compulsory	
	2090267	English for Postgraduat es	School of Foreign Languages	3	72	spring a nd autum n	compulsory	
	2090268	German as Foreign Langu age	School of Foreign Languages	3	72	spring a nd autum n	compulsory	
	2090270	First Foreign Language(Japanese)	School of Foreign Languages	3	72	spring a nd autum n	compulsory	
	2090272	First Foreign Language(Russian)	School of Foreign Languages	3	72	spring a nd autum n	compulsory	
	2090273	First Foreign Language (French)	School of Foreign Languages	3	72	spring a nd autum n	compulsory	
	2090305	Literature Reading and Translation	School of Foreign Languages	1.5	36	spring a nd autum n	elective	
	2090306	Academic English Writin g II	School of Foreign Languages	1.5	36	spring a nd autum n	elective	
	2090307	Seminar on Chinese Cult ure in the New Era II	School of Foreign Languages	1.5	36	spring a nd autum n	elective	
	2090308	Listening, Speaking and Critical Thinking II	School of Foreign Languages	1.5	36	spring a nd autum n	elective	
	2260005	Research on the Theory and Practice of Sociali sm with Chinese Charact eristics	School of Marxism	2	36	spring a nd autum n	compulsory	
	2260006	Introduction to Dialect ics of Nature	School of Marxism	1	18	spring a nd autum n	compulsory	
	2300001	Chinese Language	International Scho ol	3	72	spring a nd autum n	elective	
	2900006	A General View of China	International Scho ol	3	54	spring a nd autum n	elective	
Core Courses	2050001	Environmental Fluid Mec hanics	College of Environ mental Science and Engineering	3	54	autumn	elective	
	2050024	Environmental Assessmen t & Planning	College of Environ mental Science and Engineering	3	54	spring	elective	
	2050065	Water Pollution Control Engineering	College of Environ mental Science and Engineering	3	54	spring	elective	
	2050066	Environmental Microbiol ogy (Sino-French Cooper ation)	College of Environ mental Science and Engineering	2	36	autumn	elective	

Core Courses	2050133	Progress in Environmental Chemistry	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050134	Frontier in Environmental Science and Engineering	College of Environmental Science and Engineering	2	36	spring and autumn	compulsory	
	2050135	Molecular Ecotoxicology	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050136	Environmental System and Sustainable Development	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050143	Environmental Dimensions of Sustainable Development	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050147	Sustainable Development: Institutions and Policies	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050149	Atmospheric Science and Climate Change	College of Environmental Science and Engineering	2	36	spring	elective	
	2050155	Wastewater Treatment:Theory and Technology	College of Environmental Science and Engineering	3	54	spring	elective	
	2050156	Solid Waste Treatment and Resource Reuse	College of Environmental Science and Engineering	3	54	spring	elective	
	2050157	Air Pollution Control Engineering	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050158	Solid Waste Treatment and Resource Reuse (IFCIM)	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050159	Specialty Foreign Language (IFCIM)	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050168	Frontier of Environmental Science and Technology (IFCIM)	College of Environmental Science and Engineering	2	36	spring	elective	
	2050169	Specialized Foreign Language (Chinese)	College of Environmental Science and Engineering	2	36	spring	elective	
	2050174	The Experiment of Instrumental Analysis (Spectrum Analysis)	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050175	The Experiment of Chromatography Analysis	College of Environmental Science and Engineering	2	36	spring and autumn	elective	

Core Courses	2050176	The Experiment of Equipment Analysis (Biological Analysis)	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050177	Numerical simulation of fluid flow and heat/mass transfer	College of Environmental Science and Engineering	3	54	spring	elective	
	2050186	Integrated Solid Waste Management	College of Environmental Science and Engineering	2	36	spring	elective	
	2050188	Wastewater Treatment	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050189	Water supply: Principles and Technology	College of Environmental Science and Engineering	2	36	spring	elective	
	2050199	Ecological Economy	College of Environmental Science and Engineering	2	36	spring	elective	
	2050200	Ecosystem Management	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050201	Environmental Instrumental Analysis	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050202	Ecological and Health Risk Assessment	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050229	Integrated Solid Waste Management	College of Environmental Science and Engineering	3	54	spring	elective	
	2102002	Numerical Analysis	School of Mathematical Sciences	3	54	spring and autumn	elective	
Elective Courses	2050010	Chemical Engineering Principle	College of Environmental Science and Engineering	2	36	spring	elective	
	2050011	Colloid Chemistry and Coagulation Process	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050012	Microbial Physiology Principle	College of Environmental Science and Engineering	3	54	spring	elective	
	2050054	Urban Hydrology and Municipal Waste Water Treatment	College of Environmental Science and Engineering	2	44	spring	elective	
	2050055	Management and treatment of water	College of Environmental Science and Engineering	3	58	spring	elective	

Elective Courses	2050058	Solid Remediation	College of Environmental Science and Engineering	2	30	spring	elective	
	2050059	Resource Management and Models	College of Environmental Science and Engineering	3	60	autumn	elective	
	2050060	Monitoring and analysis of sources of pollutants	College of Environmental Science and Engineering	3	60	autumn	elective	
	2050061	Odor and Flue Gas Treatment	College of Environmental Science and Engineering	2	30	spring	elective	
	2050062	Environmental Economics	College of Environmental Science and Engineering	3	60	autumn	elective	
	2050086	Course Name:Environmental Chemistry for Health	College of Environmental Science and Engineering	2	36	spring	elective	
	2050087	Systemic Planning of Regional Water Pollution Control	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050096	Kinetics Principle in Environmental Engineering	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050098	Sludge Treatment Engineering	College of Environmental Science and Engineering	2	36	spring	elective	
	2050101	Data Management and Experimental Design	College of Environmental Science and Engineering	2	36	spring and autumn	elective	
	2050104	Urban Air Quality Management and Control	College of Environmental Science and Engineering	2	36	spring	elective	
	2050107	Urban Water Planning and Management	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050121	Progress in Wastewater Treatment Technology	College of Environmental Science and Engineering	2	36	spring	elective	
	2050137	Global Climate Change and Countermeasures	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050138	Modern Environmental Biology	College of Environmental Science and Engineering	2	36	spring	elective	
	2050141	Environmental Ethics	College of Environmental Science and Engineering	2	36	autumn	elective	

Elective Courses	2050150	Environmental Informatics	College of Environmental Science and Engineering	2	36	spring	elective	
	2050154	Advanced Oxidation Process	College of Environmental Science and Engineering	2	36	spring	elective	
	2050161	Water Treatment Instrument and Control System	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050170	Current Ecology and Application	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050191	Aquatic environmental chemistry	College of Environmental Science and Engineering	2	36	spring	elective	
	2050194	Environmental Molecular Microbiology	College of Environmental Science and Engineering	2	36	spring	elective	
	2050196	Environmental Systems Analysis	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050203	Design and Optimization of Biological Wastewater Treatment	College of Environmental Science and Engineering	3	54	spring	elective	
	2050206	Principle and application of modern biotechnology	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050207	Environmental Nano Science and Engineering	College of Environmental Science and Engineering	2	36	spring	elective	
	2050209	Principles and Application of Aquatic Chemistry	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050210	Common Experiment Principles and Step-by-step Data Processing	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050211	Literature Search and Scientific Writing	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050213	Water ecology and its application	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050216	Membrane technology for wastewater treatment and resource	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050224	water resources management	College of Environmental Science and Engineering	2	36	autumn	elective	

Elective Courses	2050225	Life Cycle Assessment	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050226	Renewable Energy Technologies	College of Environmental Science and Engineering	3	54	spring	elective	
	2050227	Bioenergy Process Engineering	College of Environmental Science and Engineering	2	36	spring	elective	
	2050228	Biomass Energy: Technology and Application	College of Environmental Science and Engineering	3	54	autumn	elective	
	2050230	Bioreactor Engineering	College of Environmental Science and Engineering	2	36	autumn	elective	
	2050231	Laboratory Environmental Health and Safety	College of Environmental Science and Engineering	1	18	autumn	compulsory	
	2050232	Bioeconomy, Energy Market and Green Market	College of Environmental Science and Engineering	3	54	spring	elective	
Compulsories	2900011	Code of Academic Integrity		1	0	spring and autumn	compulsory	
	2900012	Tongji University Advanced Lectures for Graduate Students		2	36	spring and autumn	compulsory	
	2900013	Interim Assessment		0	0	spring and autumn	compulsory	
	2900016	Thesis Proposal		1	0	spring and autumn	compulsory	

College of Environmental Science and Engineering2019grade--curriculum of training program me1

Course Type	Course Number	Course Name	Department	Credits	Hours	Season	compulsory/elective	remark	Checkbox
Common Courses	2020578	Engineering Ethics	College of Civil Engineering	2	36	spring and autumn	compulsory		
	2090044	First Foreign Language(French)	School of Foreign Languages	3	780	spring and autumn	compulsory	中法专选	
	2090267	English for Postgraduates	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090268	German as Foreign Language	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090270	First Foreign Language(Japanese)	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090272	First Foreign Language(Russian)	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090273	First Foreign Language (French)	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090305	Literature Reading and Translation	School of Foreign Languages	1.5	36	spring and autumn	elective		
	2090306	Academic English Writing II	School of Foreign Languages	1.5	36	spring and autumn	elective		
	2090307	Seminar on Chinese Culture in the New Era II	School of Foreign Languages	1.5	36	spring and autumn	elective		
	2090308	Listening, Speaking and Critical Thinking II	School of Foreign Languages	1.5	36	spring and autumn	elective		
	2260005	Research on the Theory and Practice of Socialism with Chinese Characteristics	School of Marxism	2	36	spring and autumn	compulsory		
	2300001	Chinese Language	International School	3	72	spring and autumn	elective	留学生必修	
	2900006	A General View of China	International School	3	54	spring and autumn	elective	留学生和港澳台学生必修。	
	2050001	Environmental Fluid Mechanics	College of Environmental Science and Engineering	3	54	autumn	elective	市政方向2050001、2102002、2050012、2050214至少选一门	
	2050006	New Technology of Water Supply and Sewage Drainage for High-rise Buildings	College of Environmental Science and Engineering	3	54	spring	elective	市政方向2050006、2050007、2050197、2050068中至少选一门	

Annex I

	2050007	Methods of optimization	College of Environmental Science and Engineering	2	36	autumn	elective	市政方向2050006、2050007、2050197、2050068中至少选一门	
	2050012	Microbial Physiology Principle	College of Environmental Science and Engineering	3	54	spring	elective	市政方向2050001、2102002、2050012、2050214至少选一门	
	2050065	Water Pollution Control Engineering	College of Environmental Science and Engineering	3	54	spring	elective	中法项目专选	
	2050066	Environmental Microbiology (Sino-French Cooperation)	College of Environmental Science and Engineering	2	36	autumn	elective	中法项目专选	
	2050068	Technology and Engineering of Waste Water Treatment	College of Environmental Science and Engineering	3	54	autumn	elective	市政方向2050006、2050007、2050197、2050068中至少选一门	
	2050134	Frontier in Environmental Science and Engineering	College of Environmental Science and Engineering	2	36	spring and autumn	elective	环工、环科方向必修	
	2050136	Environmental System and Sustainable Development	College of Environmental Science and Engineering	2	36	spring and autumn	elective	秋季中文授课。春季全英文授课（IESD专选）。	
	2050143	Environmental Dimensions of Sustainable Development	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
	2050147	Sustainable Development: Institutions and Policies	College of Environmental Science and Engineering	2	36	spring and autumn	elective	秋季全英文授课（IESD专选）。春季中文授课。	
Core Courses	2050149	Atmospheric Science and Climate Change	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050155	Wastewater Treatment:Theory and Technology	College of Environmental Science and Engineering	3	54	spring	elective		
	2050156	Solid Waste Treatment and Resource Reuse	College of Environmental Science and Engineering	3	54	spring	elective		
	2050157	Air Pollution Control Engineering	College of Environmental Science and Engineering	3	54	autumn	elective		
	2050158	Solid Waste Treatment and Resource Reuse (IFCIM)	College of Environmental Science and Engineering	3	54	autumn	elective	中法项目专选	
	2050159	Specialty Foreign Language (IFCIM)	College of Environmental Science and Engineering	2	36	autumn	elective	中法项目专选	
	2050168	Frontier of Environmental Science and Technology (IFCIM)	College of Environmental Science and Engineering	2	36	spring	elective	中法项目专选	
	2050174	The Experiment of Instrumental Analysis (Spectrum Analysis)	College of Environmental Science and Engineering	2	36	spring and autumn	elective	先/同时修2050201。2050174、2050175、2050176三选一。	
	2050175	The Experiment of Chromatography Analysis	College of Environmental Science and Engineering	2	36	spring and autumn	elective	先/同时修2050201。2050174、2050175、2050176三选一。	
	2050176	The Experiment of Equipment Analysis	College of Environmental	2	36	spring and	elective	先/同时修2050201。2050174、	

		(Biological Analysis)	Science and Engineering			autumn		2050175、2050176三选一。	
	2050186	Integrated Solid Waste Management	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050188	Wastewater Treatment	College of Environmental Science and Engineering	2	36	autumn	elective	IESD, BBChina 专选	
	2050189	Water supply: Principles and Technology	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050197	Theory and technology of water treatment	College of Environmental Science and Engineering	2	36	spring	elective	市政方向2050006、2050007、2050197、2050068中至少选一门	
	2050199	Ecological Economy	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050200	Ecosystem Management	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
	2050201	Environmental Instrumental Analysis	College of Environmental Science and Engineering	2	36	spring and autumn	compulsory	必修，秋季选课	
	2050214	Advanced water chemistry	College of Environmental Science and Engineering	2	36	autumn	elective	市政方向2050001、2102002、2050012、2050214至少选一门	
	2050215	Frontier in Municipal Engineering	College of Environmental Science and Engineering	2	36	autumn	elective	市政方向必修	
	2050229	Integrated Solid Waste Management	College of Environmental Science and Engineering	3	54	spring	elective	BBChina专选	
	2102002	Numerical Analysis	School of Mathematical Sciences	3	54	spring and autumn	elective	市政方向2050001、2102002、2050012、2050214至少选一门	
	2050002	Theory of Water Supply and Sewage Treatment	College of Environmental Science and Engineering	3	54	spring	elective		
	2050005	Cost Analysis in Water Supply and Sewage Engineering	College of Environmental Science and Engineering	3	54	autumn	elective		
	2050009	Advanced drinking water treatment	College of Environmental Science and Engineering	2	36	spring	elective		
	2050011	Colloid Chemistry and Coagulation Process	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050024	Environmental Assessment & Planning	College of Environmental Science and Engineering	3	54	spring	elective		
	2050052	Solid Waste Treatment and Resource Recovery	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050054	Urban Hydrology and Municipal Waste Water Treatment	College of Environmental Science and Engineering	2	44	spring	elective	中法项目专选	

	2050055	Management and treatment of water	College of Environmental Science and Engineering	3	58	spring	elective	中法项目专选	
	2050058	Solid Remediation	College of Environmental Science and Engineering	2	30	spring	elective	中法项目专选	
	2050059	Resource Management and Models	College of Environmental Science and Engineering	3	60	autumn	elective	中法项目专选	
	2050060	Monitoring and analysis of sources of pollutants	College of Environmental Science and Engineering	3	60	autumn	elective	中法项目专选	
	2050061	Odor and Flue Gas Treatment	College of Environmental Science and Engineering	2	30	spring	elective	中法项目专选	
	2050062	Environmental Economics	College of Environmental Science and Engineering	3	60	autumn	elective	中法项目专选	
	2050087	Systemic Planning of Regional Water Pollution Control	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050098	Sludge Treatment Engineering	College of Environmental Science and Engineering	2	36	spring	elective		
	2050101	Data Management and Experimental Design	College of Environmental Science and Engineering	2	36	spring and autumn	elective		
	2050135	Molecular Ecotoxicology	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050138	Modern Environmental Biology	College of Environmental Science and Engineering	2	36	spring	elective		
	2050141	Environmental Ethics	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
	2050150	Environmental Informatics	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050154	Advanced Oxidation Process	College of Environmental Science and Engineering	2	36	spring	elective		
	2050161	Water Treatment Instrument and Control System	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050177	Numerical simulation of fluid flow and heat/mass transfer	College of Environmental Science and Engineering	3	54	spring	elective		
	2050191	Aquatic environmental chemistry	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050194	Environmental Molecular Microbiology	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050196	Environmental Systems Analysis	College of Environmental	2	36	autumn	elective	全英文授课	

		Science and Engineering						
2050202	Ecological and Health Risk Assessment	College of Environmental Science and Engineering	2	36	autumn	elective		
2050203	Design and Optimization of Biological Wastewater Treatment	College of Environmental Science and Engineering	3	54	spring	elective		
2050206	Principle and application of modern biotechnology	College of Environmental Science and Engineering	2	36	autumn	elective		
2050207	Environmental Nano Science and Engineering	College of Environmental Science and Engineering	2	36	spring	elective		
2050209	Principles and Application of Aquatic Chemistry	College of Environmental Science and Engineering	2	36	autumn	elective		
2050210	Common Experiment Principles and Step-by-step Data Processing	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
2050211	Literature Search and Scientific Writing	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
2050213	Water ecology and its application	College of Environmental Science and Engineering	2	36	autumn	elective		
2050216	Membrane technology for wastewater treatment and resource	College of Environmental Science and Engineering	2	36	autumn	elective		
2050217	Biological stability of drinking water distribution systems	College of Environmental Science and Engineering	2	36	spring	elective		
2050218	Scientific reading and writing	College of Environmental Science and Engineering	2	36	autumn	elective	市政方向必修	
2050219	Water Disinfection	College of Environmental Science and Engineering	2	36	spring	elective		
2050224	water resources management	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
2050225	Life Cycle Assessment	College of Environmental Science and Engineering	3	54	autumn	elective	BBChina专选	
2050226	Renewable Energy Technologies	College of Environmental Science and Engineering	3	54	spring	elective	BBChina专选	
2050227	Bioenergy Process Engineering	College of Environmental Science and Engineering	2	36	spring	elective	BBChina专选	
2050228	Biomass Energy: Technology and Application	College of Environmental Science and Engineering	3	54	autumn	elective	BBChina专选	
2050230	Bioreactor Engineering	College of Environmental Science and Engineering	2	36	autumn	elective	BBChina专选	

	2050231	Laboratory Environmental Health and Safety	College of Environmental Science and Engineering	1	18	autumn	compulsory	必修	
	2050232	Bioeconomy, Energy Market and Green Market	College of Environmental Science and Engineering	3	54	spring	elective	BBChina专选	
	2240001	Intellectual property rights	Law School	2	36	spring and autumn	elective		
Compulsories	2900007	Full-time specialized field practice		6	0	spring and autumn	compulsory		
	2900011	Code of Academic Integrity		1	0	spring and autumn	compulsory		
	2900012	Tongji University Advanced Lectures for Graduate Students		2	36	spring and autumn	compulsory	至少参加16次。	
	2900013	Interim Assessment		0	0	spring and autumn	compulsory		
	2900016	Thesis Proposal		1	0	spring and autumn	compulsory		

College of Environmental Science and Engineering2019grade--curriculum of training program me1

Course Type	Course Number	Course Name	Department	Credits	Hours	Season	compulsory/elective	remark	Checkbox
Common Courses	2090044	First Foreign Language(French)	School of Foreign Languages	3	780	spring and autumn	compulsory	中法项目专选	
	2090267	English for Postgraduates	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090268	German as Foreign Language	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090270	First Foreign Language(Japanese)	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090272	First Foreign Language(Russian)	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090273	First Foreign Language (French)	School of Foreign Languages	3	72	spring and autumn	compulsory		
	2090305	Literature Reading and Translation	School of Foreign Languages	1.5	36	spring and autumn	elective		
	2090306	Academic English Writing II	School of Foreign Languages	1.5	36	spring and autumn	elective		
	2090307	Seminar on Chinese Culture in the New Era II	School of Foreign Languages	1.5	36	spring and autumn	elective		
	2090308	Listening, Speaking and Critical Thinking II	School of Foreign Languages	1.5	36	spring and autumn	elective		
	2260005	Research on the Theory and Practice of Socialism with Chinese Characteristics	School of Marxism	2	36	spring and autumn	compulsory		
	2260006	Introduction to Dialectics of Nature	School of Marxism	1	18	spring and autumn	compulsory		
	2300001	Chinese Language	International School	3	72	spring and autumn	elective	留学生必修	
	2900006	A General View of China	International School	3	54	spring and autumn	elective	留学生和港澳台学生必修。	
	2050001	Environmental Fluid Mechanics	College of Environmental Science and Engineering	3	54	autumn	elective		
	2050024	Environmental Assessment & Planning	College of Environmental Science and Engineering	3	54	spring	elective		

Annex I

	2050065	Water Pollution Control Engineering	College of Environmental Science and Engineering	3	54	spring	elective		
	2050066	Environmental Microbiology (Sino-French Cooperation)	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050133	Progress in Environmental Chemistry	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050134	Frontier in Environmental Science and Engineering	College of Environmental Science and Engineering	2	36	spring and autumn	compulsory	必修	
	2050135	Molecular Ecotoxicology	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050136	Environmental System and Sustainable Development	College of Environmental Science and Engineering	2	36	spring and autumn	elective	秋季中文授课。春季全英文授课（IESD专选）	
	2050143	Environmental Dimensions of Sustainable Development	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
	2050147	Sustainable Development: Institutions and Policies	College of Environmental Science and Engineering	2	36	spring and autumn	elective	秋季全英文授课（IESD专选）。春季中文授课。	
	2050149	Atmospheric Science and Climate Change	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
Core Courses	2050155	Wastewater Treatment:Theory and Technology	College of Environmental Science and Engineering	3	54	spring	elective		
	2050156	Solid Waste Treatment and Resource Reuse	College of Environmental Science and Engineering	3	54	spring	elective		
	2050157	Air Pollution Control Engineering	College of Environmental Science and Engineering	3	54	autumn	elective		
	2050158	Solid Waste Treatment and Resource Reuse (IFCIM)	College of Environmental Science and Engineering	3	54	autumn	elective		
	2050159	Specialty Foreign Language (IFCIM)	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050168	Frontier of Environmental Science and Technology (IFCIM)	College of Environmental Science and Engineering	2	36	spring	elective		
	2050169	Specialized Foreign Language (Chinese)	College of Environmental Science and Engineering	2	36	spring	elective	留学生必修	
	2050174	The Experiment of Instrumental Analysis (Spectrum Analysis)	College of Environmental Science and Engineering	2	36	spring and autumn	elective		
	2050175	The Experiment of Chromatography Analysis	College of Environmental Science and Engineering	2	36	spring and autumn	elective		
	2050176	The Experiment of Equipment Analysis	College of Environmental	2	36	spring and	elective		

		(Biological Analysis)	Science and Engineering			autumn			
	2050177	Numerical simulation of fluid flow and heat/mass transfer	College of Environmental Science and Engineering	3	54	spring	elective		
	2050186	Integrated Solid Waste Management	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050188	Wastewater Treatment	College of Environmental Science and Engineering	2	36	autumn	elective	IESD BBChina项目专选	
	2050189	Water supply: Principles and Technology	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050199	Ecological Economy	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
	2050200	Ecosystem Management	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
	2050201	Environmental Instrumental Analysis	College of Environmental Science and Engineering	2	36	spring and autumn	elective	学术学位学生 春季选课。	
	2050202	Ecological and Health Risk Assessment	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050229	Integrated Solid Waste Management	College of Environmental Science and Engineering	3	54	spring	elective	BBChina项目专选	
	2102002	Numerical Analysis	School of Mathematical Sciences	3	54	spring and autumn	elective		
	2050010	Chemical Engineering Principle	College of Environmental Science and Engineering	2	36	spring	elective		
	2050011	Colloid Chemistry and Coagulation Process	College of Environmental Science and Engineering	2	36	autumn	elective		
	2050012	Microbial Physiology Principle	College of Environmental Science and Engineering	3	54	spring	elective		
	2050054	Urban Hydrology and Municipal Waste Water Treatment	College of Environmental Science and Engineering	2	44	spring	elective	中法项目专选	
	2050055	Management and treatment of water	College of Environmental Science and Engineering	3	58	spring	elective	中法项目专选	
	2050058	Solid Remediation	College of Environmental Science and Engineering	2	30	spring	elective	中法项目专选	
	2050059	Resource Management and Models	College of Environmental Science and Engineering	3	60	autumn	elective	中法项目专选	
	2050060	Monitoring and analysis of sources of pollutants	College of Environmental Science and Engineering	3	60	autumn	elective	中法项目专选	

2050061	Odor and Flue Gas Treatment	College of Environmental Science and Engineering	2	30	spring	elective	中法项目专选	
2050062	Environmental Economics	College of Environmental Science and Engineering	3	60	autumn	elective	中法项目专选	
2050086	Course Name:Environmental Chemistry for Health	College of Environmental Science and Engineering	2	36	spring	elective		
2050087	Systemic Planning of Regional Water Pollution Control	College of Environmental Science and Engineering	2	36	autumn	elective		
2050096	Kinetics Principle in Environmental Engineering	College of Environmental Science and Engineering	2	36	autumn	elective		
2050098	Sludge Treatment Engineering	College of Environmental Science and Engineering	2	36	spring	elective		
2050101	Data Management and Experimental Design	College of Environmental Science and Engineering	2	36	spring and autumn	elective		
2050104	Urban Air Quality Management and Control	College of Environmental Science and Engineering	2	36	spring	elective		
2050107	Urban Water Planning and Management	College of Environmental Science and Engineering	2	36	autumn	elective		
2050121	Progress in Wastewater Treatment Technology	College of Environmental Science and Engineering	2	36	spring	elective		
2050137	Global Climate Change and Countermeasures	College of Environmental Science and Engineering	2	36	autumn	elective		
2050138	Modern Environmental Biology	College of Environmental Science and Engineering	2	36	spring	elective	秋季全英文授课，春季中文授课。	
2050141	Environmental Ethics	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
2050150	Environmental Informatics	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
2050154	Advanced Oxidation Process	College of Environmental Science and Engineering	2	36	spring	elective		
2050161	Water Treatment Instrument and Control System	College of Environmental Science and Engineering	2	36	autumn	elective		
2050170	Current Ecology and Application	College of Environmental Science and Engineering	2	36	autumn	elective		
2050191	Aquatic environmental chemistry	College of Environmental Science and Engineering	2	36	spring	elective	IESD专选	
2050194	Environmental Molecular Microbiology	College of Environmental	2	36	spring	elective	IESD专选	

		Science and Engineering						
2050196	Environmental Systems Analysis	College of Environmental Science and Engineering	2	36	autumn	elective	全英文授课	
2050203	Design and Optimization of Biological Wastewater Treatment	College of Environmental Science and Engineering	3	54	spring	elective		
2050206	Principle and application of modern biotechnology	College of Environmental Science and Engineering	2	36	autumn	elective		
2050207	Environmental Nano Science and Engineering	College of Environmental Science and Engineering	2	36	spring	elective		
2050209	Principles and Application of Aquatic Chemistry	College of Environmental Science and Engineering	2	36	autumn	elective		
2050210	Common Experiment Principles and Step-by-step Data Processing	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
2050211	Literature Search and Scientific Writing	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
2050213	Water ecology and its application	College of Environmental Science and Engineering	2	36	autumn	elective		
2050216	Membrane technology for wastewater treatment and resource	College of Environmental Science and Engineering	2	36	autumn	elective		
2050224	water resources management	College of Environmental Science and Engineering	2	36	autumn	elective	IESD专选	
2050225	Life Cycle Assessment	College of Environmental Science and Engineering	3	54	autumn	elective	BBChina项目专选	
2050226	Renewable Energy Technologies	College of Environmental Science and Engineering	3	54	spring	elective	BBChina项目专选	
2050227	Bioenergy Process Engineering	College of Environmental Science and Engineering	2	36	spring	elective	BBChina项目专选	
2050228	Biomass Energy: Technology and Application	College of Environmental Science and Engineering	3	54	autumn	elective	BBChina项目专选	
2050230	Bioreactor Engineering	College of Environmental Science and Engineering	2	36	autumn	elective	BBChina项目专选	
2050231	Laboratory Environmental Health and Safety	College of Environmental Science and Engineering	1	18	autumn	compulsory	必修	
2050232	Bioeconomy, Energy Market and Green Market	College of Environmental Science and Engineering	3	54	spring	elective	BBChina项目专选	
2900011	Code of Academic Integrity		1	0	spring and autumn	compulsory		

Compulsories	2900012	Tongji University Advanced Lectures for Graduate Students		2	36	spring and autumn	compulsory	至少参加16次。	
	2900013	Interim Assessment		0	0	spring and autumn	compulsory		
	2900016	Thesis Proposal		1	0	spring and autumn	compulsory		

2019级 学历教育硕士 机械与能源工程学院 动力工程及工程热物理专业(080700)

sort		Course Code	Course Name	Credit	Period	Semester	CC/EC	Department	Remark	Mult-Select
Degree Course	Common Course	2090268	German as Foreign Language	3	72	Spring Or Autumn	N	School of Foreign Languages		
		2090270	First Foreign Language(Japanese)	3	72	Spring Or Autumn	N	School of Foreign Languages		
		2090272	First Foreign Language(Russian)	3	72	Spring Or Autumn	N	School of Foreign Languages		
		2090273	First Foreign Language (French)	3	72	Spring Or Autumn	N	School of Foreign Languages		
		2090305	Literature Reading and Translation	1.5	36	Spring Or Autumn	N	School of Foreign Languages		
		2090306	Academic English Writing II	1.5	36	Spring Or Autumn	N	School of Foreign Languages		
		2090307	Seminar on Chinese Culture in the New Era II	1.5	36	Spring Or Autumn	N	School of Foreign Languages		
		2090308	Listening, Speaking and Critical Thinking II	1.5	36	Spring Or Autumn	N	School of Foreign Languages		
		2260005	Research on the Theory and Practice of Socialism with Chinese Characteristics	2	36	Spring Or Autumn	Y	Marxism School		
		2260006	Introduction to Dialectics of Nature	1	18	Spring Or Autumn	Y	Marxism School		
		2300001	Chinese Language	3	72	Spring Or Autumn	N	International School	留学生必修	
		2900006	A General View of China	3	54	Spring Or Autumn	N	International School	留学生必修港澳台学生必修	
	Core Course	2030052	Advanced Thermodynamics	3	54	Autumn	N	College of Mechanical Engineering		
		2030053	Advanced Heat Transfer	3	54	Spring	N	College of Mechanical Engineering		
		2030054	Refrigeration Technique	3	54	Autumn	N	College of Mechanical Engineering		
		2030055	Numerical Heat Transfer	3	54	Autumn	N	College of Mechanical Engineering		

sort		Course Code	Course Name	Credit	Period	Semester	CC/EC	Department	Remark	Mult-Select
		2030056	Computational Fluid Dynamics	3	54	Spring	N	College of Mechanical Engineering		
		2030070	Combustion Theory	3	54	Autumn	N	College of Mechanical Engineering		
		2030077	Combustion Pollution And Control Technology	2	36	Spring	N	College of Mechanical Engineering		
		2030225	Specialty practice	2	36	Spring	Y	College of Mechanical Engineering	必修	
		2030226	Developing front line of the specialty(thermal Energy)	1	18	Spring	Y	College of Mechanical Engineering		
		2030228	Frontier of Subject Development(engineering thermal physics)	1	18	Spring	Y	College of Mechanical Engineering		
		2030229	Frontier of Subject Development (refrigeration and cryogenic engineering)	1	18	Spring	Y	College of Mechanical Engineering		
		2030298	Cryogenic systems	2	36	Autumn	N	College of Mechanical Engineering		
		2102002	Numerical Analysis	3	54	Autumn	Y	School of Mathematical Sciences		
Elective Course		2030057	Error Theory and Experiment Data Processing	2	36	Spring	N	College of Mechanical Engineering	公共非学位课	
		2030061	Gas combustion theory and technology	3	54	Autumn	N	College of Mechanical Engineering		
		2030062	Moisture Air	3	54	Spring	N	College of Mechanical Engineering		
		2030063	Control Technique of Airflow Pattern in HVAC	2	36	Spring	N	College of Mechanical Engineering		
		2030064	Air-Conditioning Cooling Load Calculating Theory	2	36	Spring	N	College of Mechanical Engineering		
		2030067	Dust Removing Technology	2	36	Autumn	N	College of Mechanical Engineering		
		2030071	Theory and Technique of Solid Fuel Gasification	3	54	Spring	N	College of Mechanical Engineering		
		2030073	Thermal Energy Utilization	2	36	Spring	N	College of Mechanical Engineering		
		2030074	Building Energy efficiency Technology	2	36	Spring	N	College of Mechanical Engineering		
		2030075	Automatic Control Technology	2	36	Autumn	N	College of Mechanical Engineering	建议电信学院的人开课	
		2030076	Theory and Technology of Thermal Storage	2	36	Spring	N	College of Mechanical Engineering		

sort	Course Code	Course Name	Credit	Period	Semester	CC/EC	Department	Remark	Mult-Select
	2030089	Air Conditioning and Refrigeration Technique for Vehicle	3	54	Spring Or Autumn	N	College of Mechanical Engineering		
	2030097	Engineering Heat Transfer Technique and Application	2	36	Spring	N	College of Mechanical Engineering		
	2030101	Chemical Reaction Dynamics	2	36	Spring	N	College of Mechanical Engineering		
	2030109	Building and Energy Consumption	2	36	Autumn	N	College of Mechanical Engineering		
	2030113	Air Cleaning Technology	2	36	Autumn	N	College of Mechanical Engineering		
	2030116	Cold Chain Technique	3	54	Autumn	N	College of Mechanical Engineering		
	2030120	Gas-Solid Two Phases Fluid Theory and Calculation	2	36	Spring	N	College of Mechanical Engineering		
	2030121	Gas Transmission and Distribution Theory And Technology	2	36	Spring	N	College of Mechanical Engineering		
	2030123	Numerical Simulation of Combustion Processes	2	36	Spring	N	College of Mechanical Engineering		
	2030124	Gas combustion stability and interchangeability	2	36	Autumn	N	College of Mechanical Engineering		
	2030130	Indoor Environment and It's Control	2	36	Autumn	N	College of Mechanical Engineering		
	2030131	Indoor Air Quality and Pollutant Control	3	54	Spring	N	College of Mechanical Engineering		
	2030140	Absorption Refrigeration	2	36	Autumn	N	College of Mechanical Engineering		
	2030148	Current Heat Pump Air-Conditioning Systems	2	36	Autumn	N	College of Mechanical Engineering		
	2030154	Measurement and Control of Refrigeration Systems	2	36	Spring	N	College of Mechanical Engineering		
	2030246	Refrigeration System Modeling and Analysis	2	36	Spring	N	College of Mechanical Engineering		
	2030300	Experiments of Power & Energy Engineering	2	36	Autumn	N	College of Mechanical Engineering		
	2050225	Life Cycle Assessment	3	54	Autumn	N	School of Environmental Science and Engineering	选修（BBChina）	
	2050226	Renewable Energy Technologies	3	54	Spring	N	School of Environmental Science and Engineering	选修（BBChina）	
	2050227	Bioenergy Process Engineering	2	36	Spring	N	School of Environmental Science and Engineering	选修（BBChina）	

sort	Course Code	Course Name	Credit	Period	Semester	CC/EC	Department	Remark	Mult-Select
	2050228	Biomass Energy: Technology and Application	3	54	Autumn	N	School of Environmental Science and Engineering	选修（BBChina）	
	2050230	Bioreactor Engineering	2	36	Autumn	N	School of Environmental Science and Engineering	选修（BBChina）	
	2050232	Bioeconomy, Energy Market and Green Market	3	54	Spring	N	School of Environmental Science and Engineering	选修（BBChina）	
	2090269	Second Foreign Language(German)	2	36	Spring Or Autumn	N	School of Foreign Languages	公共非学位课	
	2090271	Second Foreign Language(Japanese)	2	36	Spring Or Autumn	N	School of Foreign Languages	公共非学位课	
	2102001	Matrix Analysis	3	54	Autumn	N	School of Mathematical Sciences	公共非学位课	
	2102003	Stochastic Process	3	54	Spring	N	School of Mathematical Sciences	公共非学位课	
	2102005	Applied Statistics	3	54	Autumn	N	School of Mathematical Sciences	公共非学位课	
	2102006	Numerical method for partial differential equations(I)	3	54	Spring	N	School of Mathematical Sciences	公共非学位课	
	2102007	Optimization Method	2	36	Spring	N	School of Mathematical Sciences	公共非学位课	
Compulsories	2900002	Thesis Proposal	1	0	Spring Or Autumn	Y	Graduate School		
	2900011	Code of Academic Integrity	1	0	Spring Or Autumn	Y	Graduate School		
	2900012	Tongji University Advanced Lectures for Graduate Students	2	36	Spring Or Autumn	Y	Graduate School	至少参加16次	
	2900013	Interim Assessment	0	0	Spring Or Autumn	Y	Graduate School		

机械与能源工程学院 动力工程及工程热物理 2019级 学历教育硕士--培养方案基本信息

一.简介

同济大学动力工程及工程热物理一级学科（0807）源于1926 年，历史悠久。目前拥有四个二级学科包括热能工程、制冷与低温工程、工程热物理和动力机械及工程，其中动力机械及工程设置在汽车工程学院。本学科于1986年获批热能工程博士学位授权，2003年获批动力机械及工程博士学位授权，2006年获批一级学科硕士学位授予权，2018年获批一级学科博士学位授予权。目前，在校学术型硕士研究生40余人，在校全日制专业学位硕士研究生50余人，在校博士研究生20余人。

热能工程（080702）

热能工程与1981年获得首批硕士学位授予权、1986年获批博士学位授予权。本专业方向以燃烧学、工程热力学、传热学、流体力学的理论为基础，集能源转化和利用的基础研究、系统开发和优化、产品开发设计、管理、自动化等技术于一体的综合性学科，在机械与能源工程学院本专业最早拥有硕士和博士学位授予权，并可接受博士后的培养。现有博士生导师9人，硕士生导师14人。本学科在废弃物能源化、高效换热器开发、燃烧与污染物控制、热能利用和节能、分布式能源等方面形成学科的研究特色。近年来，本学科完成国家、省部级重大/重点科研项目数项，获国家和省部级科技进步奖多项。

目前学科承担着多项国家自然科学基金、国家重大科技专项、国家973计划子课题以及上海市研究项目等，为研究生的培养奠定了坚实的基础、提供了有力支撑和良好的科研环境。

制冷及低温工程（080705）

制冷及低温工程专业的特色研究方向主要包括商用空调制冷热泵技术、车用空调制冷技术、低温制冷机与气体能源利用等，相关研究达到国内甚至国际先进水平。现有博士生导师3人，硕士生导师9人。近年来，本学科在系统仿真、建筑节能等领域获得省部级科技进步奖多项。目前学科承担多项国家自然科学基金项目、国内外知名企业的产学研合作项目。研究生培养注重创新与实践能力、国际交流能力。研究生毕业后主要去向知名外企研发中心、出国留学等。

工程热物理（080701）

工程热物理专业创立于1955年创建，1958年招收研究生，是我国建筑热工研究的主要开创单位。

该学科结合国家建设需要，围绕“建筑热工理论与技术”、“燃烧理论与技术”、“热能利用”、“新能源开发及利用”等方向，进行人才高地和研究基地的建设，近5年承担国家、省部级、国际合作等科研项目10余项。在教学上承担全院以及外学院传热学、工程热力学课程。在低品余热回收发电、区域能源网络、太阳能利用以及建筑群落间和建筑物内及建筑物群落间污染物的传播研究具有明显的研究特色和较强的学科综合优势。

二.培养目标

坚持社会主义办学方向，立德树人，努力培养新时代中国特色社会主义伟大事业的建设者和接班人。

1.具有坚定正确的政治方向，热爱社会主义祖国，拥护中国共产党的领导；努力学习马克思主义、毛泽东思想、邓小平理论、“三个代表”重要思想、科学发展观和习近平新时代中国特色社会主义思想体系；具有为人民服务和为祖国富强而艰苦奋斗的献身精神；自觉遵纪守法、有良好的道德品质。

2.具有实事求是、勇于探索和创新的科学精神。

3.学术型硕士研究生培养的专业目标：具有能源工程学科（热能工程、低温与制冷工程、工程热物理）良好学术素养的高层次专门人才。

（1）掌握坚实的基础理论和系统的专业知识；

（2）具有从事科学研究和独立解决实际问题的能力；

（3）具有应用外语开展学术研究和学术交流的基本能力；

（4）具有良好的协调、管理与组织能力。

4. 身心健康。

三.研究方向

工程热物理（080701）主要研究方向：

1．建筑热物理Building thermal physics

2．高效洁净燃烧理论 High efficiency combustion: theory & applications

3．区域能源系统优化Regional energy system and its optimization

4. 强化传热技术 heat transfer enhancement

热能工程（080702）主要研究方向：

1. 废弃物热处理及能源化技术Wastes thermal treatment and waste-to-energy technologies

2. 新能源与可再生能源开发利用 Renewable energy conversion and utilization technologies

3. 工业节能与余热利用 Industrial energy savings and waste heat recovery

4. 燃烧污染物生成与控制 Combustion and pollution control

5. 分布式能源系统 Distributed energy system technologies

6. 生物循环经济：生物能源、生物燃料和生物基产品 Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China (BBChina)

制冷及低温工程（080705）主要研究方向：

1.制冷热泵通用仿真与控制技术 Generic modeling and control methods for refrigeration and heat pump systems

2.高效低温制冷机. High-efficiency cryocooler

3. 车辆空调制冷技术 Vehicle air conditioning systems

四.学制及学习年限

1.学术型硕士研究生学制2.5年；最长修读年限不超过4年。Ordinary Ph.D. student system is 4 years; the longest duration is no more than 7 years.(普通博士生学制4年，最长修读期限不超过7年)

2.对部分提前完成培养计划，学位论文符合申请答辩要求的研究生，经过规定的批准程序可以提前答辩、毕业并申请学位。

五.学分要求

研究生在导师指导下选课。研究生课程实行学分制。公共课程的学分计算参照国家相关规定。专业课程的学分计算方法为，以在每学期中课内18学时为1学分。每门研究生课程（除第一外语外）原则上应在一学期内完成。

1.学术型硕士研究生至少应修满30学分，其中公共学位课6学分，专业学位课12学分（其中，可选跨学科、跨学院专业学位课2学分），非学位课8学分，必修环节4学分。

2.专业学位课：学科前沿2学分、学科专业核心课程等6学分，专业实验类、实践类、社会调研、研究方法课程4学分。

3.非学位课程：跨学科门类/学院课程至少2学分，其他自选。

4.课程设置参见附录。

5.补修课程：攻读本专业硕士学位所必须具备的专业基础课程，一般包括传热学、工程热力学、流体力学等，不计学分。对于跨专业考入的学生必须在导师指导下补修。

六.论文工作

学位论文是研究生培养的重要环节，是培养研究生从事科研工作和开展实际（专业）工作能力的主要途径。研究生应在导师指导下独立完成学位论文。学位论文应全面达到“培养目标”所规定的各项要求。论文选题、中期考核等环节的考核，原则上采用集体审查，统一标准、实事求是、公平公正，统一评分，考核成绩。

学位论文原则上应用汉语撰写；对于用汉语授课并享受中国政府奖学金的硕士留学研究生，学位论文如用英语（德语、法语）撰写，硕士学位论文不少于3000汉字摘要；对于其他情况（含用英语授课）的硕士留学研究生，学位论文如用英语（德语、法语）撰写，可不要求撰写汉语摘要，但必须有英语摘要。

1.论文选题：按二级学科集中进行论文选题，60分以下为不通过。两次不通过者，视为自动终止学业，取消学籍作肄业处理。

2.中期考核：鼓励集中进行中期考核，进行二级学科以上的排序，60分以下为不通过。两次不通过者，视为自动终止学业，取消学籍作肄业处理。考核成绩分等级录入管理信息系统。

3.预答辩、盲审：鼓励各学科实行硕士学位论文预答辩或盲审。按照《动力工程及工程热物理学科关于开展学位论文“查重”检测的通知》和《同济大学机械与能源工程学院关于开展研究生学位论文查重检测的实施细则（试行）》要求，学位论文提交答辩审批之前，进行“查重”检测。硕士研究生的学位论文参加校学位办公室组织的上海市学位办的双盲检查。

4.答辩：硕士学位论文的要求、送审评阅和答辩组织、评阅程序、答辩程序，按照《同济大学学位授予工作细则》第七条至第十二条执行。研究生在申请论文答辩时，未能达到规定的学术论文发表要求，但已完成培养计划，经学科专业委员会审核同意可申请论文答辩，答辩通过者，可先予以毕业。其学位申请按《同济大学关于博士硕士学位申请者发表学术论文的规定》第六条执行。

涉密学位论文及申请学位的保密管理工作，按《同济大学涉密研究生学位论文及申请学位管理暂行规定》执行。

七.学术成果

按照《同济大学关于博士硕士学位标准及学位申请者发表学术成果的规定》执行，各学科学位标准及规定由学位评定分委会制定。申请硕士学位者，在校期间应以第一作者（导师必须为通讯作者）或以第二作者（导师必须为第一作者），且第一作者署名单位为同济大学，至少在与本专业相关的国内外学术期刊或具有出版统一书号的国际和国内学术会议论文集上（学术期刊或者会议不得是列入同济大学机械与能源工程学院学术刊物黑名单目录中的期刊和会议），公开发表一篇学术论文；或至少以第三作者（导师至少是第一、或第二、或通讯作者，博士生为第一、或第二作者，且第一作者署名单位为同济大学）在SCI学术期刊上发表论文一篇或一篇以上（论文内容需与其学位论文选题相关）。

八.退出机制

各学院和专业可以在论文选题和中期考核等环节设立退出机制。论文选题或中期考核两次不通过者，视为自动终止学业，取消学籍作肄业处理。

九.备注

1.课程学习一般安排在第1-1.5学年，包含学术与职业素养讲堂课程的所有必修环节在中期考核前完成。

2.学位论文选题和中期考核相距时间不少于2个月，中期考核和学位论文答辩相距时间不少于6个月。

3.提前完成培养计划和提前答辩请参照《同济大学学术型硕士研究生培养工作规定》。

4.学术与职业素养讲堂是指由研究生院，各学部或学院组织的有规律的高水平学术讲座，研究生在中期考核前听取不少于16次的学术讲座，并将心得体会录入研究生管理信息系统。

5.专业课程经本人申请、导师和任课教师同意、报研究生院培养处审核备案，可予免修。但仍需参加该门课程考试，记录考试成绩。

6.对课程考试或相关环节考核不合格的研究生，允许在规定期限内通过补考、重修、重新开题、重新中期考核、修改论文、重新评审和重新答辩等方式重予考核。

7.考试（考核）成绩应作为评定学业奖学金、申请助学金、国家奖学金等奖项的重要依据。中期考核成绩优秀的全日制学术型硕士研究生可按相关规定申请硕博连读。

机械与能源工程学院 动力工程及工程热物理 2019级 学历教育硕士--培养方案课程信息

课程性质	课程代码	课程名称	开课院系	学分	总学时	开课学期	是否必修	备注	多选组
公共学位课	2090270	第一外国语(日语)	外国语学院	3.0	72	春秋季	是	必修	
	2090268	第一外国语（德语）	外国语学院	3.0	72	春秋季	是	必修	
	2300001	第一外国语（汉语）	国际文化交流学院	3.0	72	春秋季	否	留学生必修	
	2090273	第一外国语（法语）	外国语学院	3.0	72	春秋季	是	必修	
	2260005	中国特色社会主义理论与实践研究	马克思主义学院	2.0	36	春秋季	是	必修	
	2900006	中国概况	国际文化交流学院	3.0	54	春秋季	否	留学生必修	

	2260006	自然辩证法概论	马克思主义学院	1.0	18	春秋季	是	必修	
	2090272	第一外国语（俄语）	外国语学院	3.0	72	春秋季	是	必修	
	2090267	第一外国语（英语）	外国语学院	3.0	72	春秋季	是	必修	
专业学位课	2030055	计算传热学	机械与能源工程学院	3.0	54	秋季	否		
	2030053	高等传热学	机械与能源工程学院	3.0	54	春季	否		
	2030070	燃烧学	机械与能源工程学院	3.0	54	秋季	否		
	2030052	高等热力学	机械与能源工程学院	3.0	54	秋季	否		
	2030056	计算流体力学	机械与能源工程学院	3.0	54	春季	否		
	2030225	专业实践	机械与能源工程学院	2.0	36	秋季	是	必修	
	2102002	数值分析	数学科学学院	3.0	54	春秋季	是		
	2030077	燃烧污染与控制技术	机械与能源工程学院	2.0	36	春季	否		
	2030054	制冷技术	机械与能源工程学院	3.0	54	秋季	否		
	2030298	低温技术	机械与能源工程学院	2.0	36	秋季	否		
专业学位课	2030226	学科发展前沿（热能）	机械与能源工程学院	1.0	18	春季	是		3 选 1
	2030228	学科发展前沿（工程热物理）	机械与能源工程学院	1.0	18	春季	是		
	2030229	学科发展前沿（制冷与低温工程）	机械与能源工程学院	1.0	18	春季	是		
非学位课	2090269	第二外国语（德语）	外国语学院	2.0	36	春秋季	否	公共非学位课	
	2030116	冷藏链技术	机械与能源工程学院	3.0	54	秋季	否		
	2090271	第二外国语(日语)	外国语学院	2.0	36	春秋季	否	公共非学位课	
	2030073	热能利用	机械与能源工程学院	2.0	36	春季	否		
	2102005	应用统计	数学科学学院	3.0	54	秋季	否	公共非学位课	
	2030071	固体燃料气化理论与技术	机械与能源工程学院	3.0	54	春季	否		
	2030089	车辆空调制冷技术	机械与能源工程学院	3.0	54	春秋季	否		
	2030154	制冷系统测试与控制技术	机械与能源工程学院	2.0	36	春季	否		
	2102001	矩阵论	数学科学学院	3.0	54	秋季	否	公共非学位课	
	2102003	随机过程	数学科学学院	3.0	54	春季	否	公共非学位课	
	2030074	建筑节能技术	机械与能源工程学院	2.0	36	春季	否		
	2030097	工程传热技术与应用	机械与能源工程学院	2.0	36	春季	否		
	2030101	化学反应动力学	机械与能源工程学院	2.0	36	春季	否		
	2030113	空气洁净技术	机械与能源工程学院	2.0	36	秋季	否		
	2030120	气固两相流理论与计算	机械与能源工程学院	2.0	36	春季	否		
	2030123	燃烧过程数值模拟	机械与能源工程学院	2.0	36	春季	否		
	2030140	吸收式制冷	机械与能源工程学院	2.0	36	秋季	否		
	2030148	现代热泵空调系统	机械与能源工程学院	2.0	36	秋季	否		
	2030061	燃气燃烧理论与技术	机械与能源工程学院	3.0	54	春季	否		
	2030062	湿空气学	机械与能源工程学院	3.0	54	春季	否		

	2030063	通风空调气流控制技术	机械与能源工程学院	2.0	36	春季	否	
	2030067	空气除尘技术	机械与能源工程学院	2.0	36	秋季	否	
	2030075	自动控制技术	机械与能源工程学院	2.0	36	秋季	否	建议电信学院的人开课
	2030076	蓄能空调理论与技术	机械与能源工程学院	2.0	36	春季	否	
	2030121	燃气输配理论与技术	机械与能源工程学院	2.0	36	春季	否	
	2030124	燃烧稳定性和燃气互换性	机械与能源工程学院	2.0	36	秋季	否	
	2030130	室内环境及其控制	机械与能源工程学院	2.0	36	秋季	否	
	2030131	室内空气品质及污染物控制	机械与能源工程学院	3.0	54	春季	否	
	2102006	偏微分方程数值解Ⅰ	数学科学学院	3.0	54	春季	否	公共非学位课
	2102007	最优化方法	数学科学学院	2.0	36	春季	否	公共非学位课
	2030057	误差理论及实验数据整理	机械与能源工程学院	2.0	36	春季	否	公共非学位课
	2030064	空调负荷计算理论	机械与能源工程学院	2.0	36	春季	否	
	2030109	建筑与能源利用	机械与能源工程学院	2.0	36	秋季	否	
	2030246	制冷系统仿真与分析	机械与能源工程学院	2.0	36	春季	否	
	2030300	热能与动力工程专业实验	机械与能源工程学院	2.0	36	秋季	否	
	2050225	生命周期分析	环境科学与工程学院	3.0	54	秋季	否	选修(BBChina)
	2050226	可再生能源技术	环境科学与工程学院	3.0	54	春季	否	选修(BBChina)
	2050227	生物质能源过程工程	环境科学与工程学院	2.0	36	春季	否	选修((BBChina)
	2050228	生物质能技术与应用	环境科学与工程学院	3.0	54	秋季	否	选修((BBChina)
	2050230	生物反应器工程	环境科学与工程学院	2.0	36	秋季	否	选修(BBChina)
	2050232	生物经济、能源市场与绿色经济市场	环境科学与工程学院	3.0	54	春季	否	选修(BBChina)
必修环节	2900013	中期考核	研究生院	0.0	0	春秋季	是	
	2900012	同济高等讲堂	研究生院	2.0	36	春秋季	是	至少参加16次
	2900002	论文选题	研究生院	1.0	0	春秋季	是	
	2900011	研究生学术行为规范	研究生院	1.0	0	春秋季	是	

Tongji University

College of Environmental Science and Engineering

Study Plan for Master Degree in "Environmental Engineering"

Program on "Bio-Based Circular Economy"

Degree Offered: M.Eng in Environmental Engineering.

Objectives and Learning Outcomes of the Master:

The proposed program is designed to prepare highly-skilled engineers and managers in the biomass to energy and bioproducts chain, who will be able to coordinate the design and implement solutions to solve challenges with respect to technical, economic, environmental, and ecological constraints. Therefore, this master program will cover the topics, such as energy conversion technologies, including different biochemical routes, system design and optimization from both technical and economical perspectives, project management, legal restrictions and also aspects of climate change, pollution and the integration of renewable energies.

The Program will additionally be fostered through lectures oriented to the development of entrepreneurship skills for sustainable business growth.

The master program is set-up and organised within the ERASMUS+ Project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina), co-funded by the European Union.

The program belongs to the Department of Environmental Engineering at Tongji University.

I. Program Objectives

To prepare highly qualified engineers, managers, researchers and high-level operators in the field of biomass to energy and bioproducts, that will be able to complexly apply the acquired knowledge to form, assess and make effective decisions on biomass based projects, on the basis of scientific argumentations. The graduate will be able to follow the complex biomass to energy and bioproducts chain, to optimise each step of the chain and choose the adequate technology for every different step. The graduate will also be able to select the best conversion route for each raw material considered as the starting point, and will be able to deal with the technology, market

and regulation issues and to operate within the green market. Furthermore, the graduate will have the necessary entrepreneurship knowledge and skills to start-up his/her own biomass based activity.

II. Acquired Competences, Abilities and Skills:

- In-depth knowledge of the biomass and raw material provision sources and routes, including agricultural and forestry practices as well as algae production methodologies.
- In-depth knowledge of waste to energy technologies and waste management.
- In-depth knowledge of the biomass to energy chain issues, including logistics.
- In-depth knowledge in the biomass to energy conversion technologies, and their fundamental thermochemical, biological, chemical and other technological concepts.
- In-depth knowledge of the main biomass to energy plant typologies.
- In-depth knowledge of the chemistry basis of the biofuel production, and related technologies from 1st generation to 4th generation biofuels.
- In-depth knowledge of the biorefinery concept, and of the routes for bioproducts production including bioplastics, biochemicals, soil amendments, building materials, pharmaceuticals etc.
- In-depth knowledge in the bio-based economy, market and policy issues.
- Advanced knowledge in other energy conversion technologies (including renewable energy technologies "other" than biomass) and energy efficiency.
- Advanced knowledge of the legislative and support strategies to rule and foster the renewable energy development, with a special focus on the bioenergy chain.
- Advanced Knowledge in the Green Market strategies.
- Advanced knowledge in the environmental issues related to energy production, sustainability and Life Cycle Assessment concept and tools.
- Advanced knowledge in the Secondary Pollution Control Issues related to biomass production and use.
- Advanced Knowledge in the renewable electricity integration in the grid.
- Ability to develop and implement strategies to address major challenges in the biomass to energy chain.
- Ability to merge knowledge from multi-disciplinary fields to design, develop and assess new solutions for biomass to energy and bioproducts challenges.
- Ability to tackle issues in the design of the biomass to energy and bioproducts conversion routes.
- Ability to develop market strategies for bioproducts.
- Ability to analyse and improve a biorefinery process.
- Advanced Entrepreneurial skills.
- Ability to pursue a Ph.D. degree.

General Rules and Conditions:

The proposed program is designed to last 2.5 years.

I. Areas of specialty for admission to the M.Eng Program:

Holders of the bachelor's degree in:

- Engineering (Environmental engineering, Chemical Engineering, Energy Engineering, etc.)
- Environmental Sciences
- Biotechnology

Study Plan:

This Study Plan is equivalent to 120 ECTS (European Credit Transfer and Accumulation System) distributed as follows:

	Chinese Credits / Hours	ECTS	Notes	Year
Public Courses	6/126	*Not applicable*	Courses such as "*Foreign language*", "*Dialectics of Nature*" and "*Theory and Practice of Socialism with Chinese Characteristics*"	**YEAR 1**
Degree Courses	8/144	19.2	These are the courses that are necessary to get the *"Degree in"*	
BBChina Obligatory Courses	5/90	12	These are the obligatory courses of the BBChina	
BBChina Elective Courses	12/216	28.8	These are the elective courses of the BBChina	
Project + entrepreneurship + Traineeship/internship		30	Entrepreneurship Course, Project elaboration, Traineeship/Internship	**YEAR 2 & First half YEAR 3**
Master Thesis		30	Master Thesis	
Total:		**120**		

Details of the Courses:

I. Public Courses (126 Credit Hours / No equivalence in ECTS):

Course Title	Credits / Hours	ECTS
Foreign Language (English, French, German, Japanese, Russian)	3/72	
Theory and Practice of Socialism with Chinese Characteristics	2/36	
Dialectics of Nature	1/18	

II. Degree Courses (144 Credit Hours/ 19.2 ECTS):

Course Title	Credits / Hours	ECTS
Frontier in Environmental Science and Engineering (in Chinese)	2/36	4.8
Environmental Instrumental Analysis (in Chinese)	2/36	4.8
Academic and Professional Lectures	2/36	*4.8*
The student must choose 1 course within the following		
The Experiment of Instrumental Analysis (Spectrum Analysis) (in Chinese)	2/36	*4.8*
The Experiment of Instrumental Analysis (Chromatography Analysis) (in Chinese)	2/36	*4.8*
The Experiment of Instrumental Analysis (Biological Analysis) (in Chinese)	2/36	*4.8*

III. BBChina Obligatory Courses (90 Credit Hours / 12 ECTS):

Course Title	Credits / Hours	ECTS
Integrated Solid Waste Management	3/54	7.2
Wastewater Treatment: Principles and Technology	2/36	4.8

IV. BBChina Elective Courses (216 Credit Hours to be chosen/ 28.8 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Bioreactor Engineering (ECUST)	2/36	4.8
Bioenergy Process Engineering (ECUST)	2/36	4.8
Plant Development Biology (SCU)	3/54	7.2
Chemistry of Carbohydrates (SCU)	3/54	7.2
Life Cycle Assessment (SCU)	3/54	7.2
Biomass Energy: Technology and Application (SCU)	3/54	7.2
Renewable Energy Technologies (UNIFI)	3/54	7.2
Bioeconomy, Energy Market and Green Market (MDH)	3/54	7.2
Thermal Waste management and WtE technologies (TJU)	2/36	4.8
Combustion (TJU)	3/54	7.2

V. Development of entrepreneurial Skills (Supporting E&T action / 6 ECTS)

The learning activities related to the promotion of the entrepreneurial spirit will focus on the development of the following skills: self-branding, team building, creative thinking/analytical thinking, resilience, leadership, market, gaining the customer perspective, lean start-up, economic and financial planning, design thinking for start-up, how to prepare a pitch, patent, market, value proposition, and understanding the mechanisms of investment of a venture capital and grants.

VI. Project Development (24 ECTS):

Project assignment is combined with thesis work (1 year after enrolment). Each master student should participate in the professional practice and the relevant research projects for the thesis needs. Graduate students are required to submit thesis proposal and write a professional practice summary report.

VII. Master Thesis (30 ECTS):

A Master's thesis should be carried out by the student independently under the guidance of his mentor or advisor, 1 year after enrolment. The time for the thesis work from the date of the approval of thesis proposal (1-1.5 years after enrolment) should not be less than 1 year in principle. The general procedures for Master thesis are: literature reading and critical review → thesis proposal → scientific research → writing thesis → thesis defence.

The Master's degree certification will be awarded only for the students who have satisfactorily completed all the coursework and thesis requirements and those who meet the requirement of Regulations Concerning Academic Degree in the People's Republic of China. Students who have completed the coursework requirements but have failed to complete the thesis requirement will be provided a certification for completing the coursework only. At least one publication in an academic journal or academic conference is to be made from a thesis.

The evaluation of the thesis should follow the following procedures:

(i) Evaluation made by the adviser and modification made by the student.

(ii) Deliver the thesis to two experts (professors or associate professors, advisor is excluded) for peer review one month before the defence.

(iii) Obtain permission for the thesis defence. Thesis defence can be done only after the thesis review by the two experts are passed.

(iv) Thesis defence and obtain permission from the thesis jury (Thesis Committee), which should consist of 3-5 professors or associate professors.

Copyright Notice

use. You may not and may not allow others to reproduce or distribute lecture notes and course materials publicly whether or not a fee is charged, without the Project's express written consent.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

BBChina
Master Program
on Bio-Based Circular Economy

Master Program Approval Procedure at East China University of Science and Technology (ECUST)

1) June 2018: Introduce BBChina program and curriculum framework to the Dean of Mechanical and Power Engineering and the Deputy Dean of graduate school who is responsible for education. Positive supports were obtained.
2) November to December 2018: Apply for adding to-be-established BBChina courses (such as Wastewater Treatment: Theory and Technology, Integrated Solid Waste Management, Bioeconomy, Energy Market and Green Market, Renewable Energy Technologies, Plant development biology, etc.) into ECUST Course System, besides those already established ones such as Bioreactor Engineering and Bioenergy Process Engineering.

The following table summarises the Internal ECUST IDs of the different established courses.

Course Title	**ECUST ID**
Integrated Solid Waste Management	004M0807FFC008
Wastewater Treatment: Theory and Technology	004M0807FFC012
Bioreactor Engineering	003M0817FFB004
Biomass process engineering	003M0817FFC001
Plant development biology	004M0807FFC009
Biomass Energy: Technology and Application	004M0807FFC013
Chemistry of carbohydrates	004M0807FFC014
Renewable Energy Technologies	004M0807FFC011
Bioeconomy, Energy Market and Green Market	004M0807FFC010
Life Cycle Assessment	004M0807FFC016
Combustion	004M0807FFC015
Thermal Waste management and WtE technologies	004M0807FFC017

The following pages present the print screen of the NEW developed/included BBChina courses as available from the internal system catalogue.
The last page includes the communication to the Coordinator of the Approval of the Master Course at ECUST.

Co-funded by the Erasmus+ Programme of the European Union

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004N0807FFC012	课程名称：	污水处理理论与技术（含英文）
课程英文名称：	Wastewater Treatment: Theory and Technology		
课程类别：	硕士必读	课程规格：	进修课程
学分：	2	考试方式：	闭卷考试
课程学时：	36	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☑ ☑ ☐ ☐ ☐ ☐ ☐ ☐	上课教师：	徐春东, 于新海
课程构成：			
课程内容简介：	污水处理理论与技术是面向环境工程和环境科学专业硕士生的专业课。本课程介绍了污水处理的理论与技术，以及相关学科方向的最新研究进展。课题水质、水污染、微生物反应动力学、稳定塘、活性污泥法生物处理、脱氮除磷、厌氧生物处理、生态处理、有毒有害有机物控制等内容。使学生了解污水性质，及其物理化学处理方法的理论与技术，有助于学生设计、运行和管理污水厂。		
英文内容简介：	"Wastewater Treatment: Theory and Technology" is a specialized course for master students majoring in environmental engineeringand environmental science. The course focuses on the up-to-date theories and technologies of wastewater treatment. It presents a description of wastewater characteristics and the theories of physicaland biological processes. The course contents include water quality, water pollution, microbial kinetics, trickling filter, activated sludge process, nitrification, denitrification, phosphorus removal, anaerobic treatment, ecological treatment, removal and fate of hazardous organic chemicals, etc. Through the study of this course, students are required to masterthe basictheory andtechnology for wastewater treatment, and to understand the relevantresearch trends. The knowledge will help the students in designing, operation and management of wastewater treatment plants.		
教学大纲：	Course overview; Water quality 2 Class Hours Water pollution 2 Class Hours Wastewater treatment: Preliminary and primary treatment 2 Class Hours Fundamentals of Biological Treatment 4 Class Hours Trickling filter 2 Class Hours Activated sludge process 4 Class Hours Midterm review and discussion 2 Class Hours Removal and recovery of nutrients 4 Class Hours Anaerobic process, on-site wastewater disposal 2 Class Hours Ecological treatment 2 Class Hours Sludge treatment and disposal 2 Class Hours Removal and fate of hazardous organic chemicals 2 Class Hours Course review and discussion 4 Class Hours Final exam 2 Class Hours		
考试大纲：			
主要参考书目：	1. Jerry A. Nathanson. Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control. 清华大学出版社（影印版），2011年第五版. 2. Rittmann B. E. and McCarty P. L. Environmental Biotechnology: Principles and Applications. McGraw-Hill Companies, Inc. 2001. 3. Metcalf & Eddy, Inc. Wastewater Engineering: Treatment and Reuse. McGraw-Hill Companies, Inc. Fourth Edition. 2003.		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0S07FFC00S	课程名称：	全过程固体废物管理（全英文）
课程英文名称：	Integrated Solid Waste Management		
课程类别：	硕士生课	课程规格：	进修课程
学分：	3	考试方式：	闭卷考试
课程学时：	54	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☐ ☐ ☑ ☑ ☐ ☐ ☐ ☐	上课教师：	涂春东，于新海
课程构成：	考试+课程报告		
课程内容简介：	“全过程固体废物管理”是面向环境工程、环境科学专业硕士研究生的专业课，采用全英文授课，是欧盟Erasmus+计划BBChina项目（生物循环经济硕士项目：从田野到生物能源、生物燃料和生化制品）建设课程。本课程介绍了固体废物的产生、性质及可能的环境污染，国内外现有处理处置与资源化利用技术的原理和方法。通过学习，掌握主流的固体废物处理与资源回收利用技术，为将来进一步学习和论证环境或从事有关这方面的工作打下一个良好的基础。		
英文内容简介：	“Integrated Solid Waste Management” is a specialized course for master students majoring in environmental engineering and environmental science. The course is developed by the Erasmus+ Capacity Building in Higher Education project “Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China” (BBChina). The course provides an introduction to solid waste generation, characteristics, and possible hazards to environment; principles and state-of-the-art technologies of solid waste treatment and beneficial reuse; integrated solid waste management.		
教学大纲：	Course overview 2 class hours Solid waste characterization 4 class hours Solid waste collection and transportation 4 class hours Solid waste pretreatment 4 class hours Biological treatment of solid waste 8 class hours Course discussion 4 class hours Thermochemical treatment of solid waste 8 class hours Solid waste solidification/stabilization 2 class hours Land application of solid waste 8 class hours Hazardous waste treatment, disposal and reuse 4 class hours Life cycle assessment for integrated solid waste management 2 class hours Course review and discussion 2 class hours Final exam 2 class hours		
考试大纲：			
主要参考书目：	[1] 何品晶. 固体废物处理与资源化技术. 北京：高等教育出版社, 2011 (He Pinjing. Solid Waste Treatment and Resource Recovery Technologies. Beijing: Higher Education Press, 2011.) [2] Tchobanoglous G, Theisen H, Vigil S. Integrated Solid Waste Management - Engineering Principles and Management Issues. New York: McGraw-Hill, 2ndedition, 1993. [3] Christensen TH. Solid Waste Technology and Management. Malaysia: John Wiley & Sons, 1stedition, 2010. [4] Tchobanoglous G, Kreith F. Handbook of Solid Waste Management. New York:McGraw-Hill, 2nd ed. 2001.		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0807FFC010	课程名称：	生物经济、能源市场与绿色经济市场（全英文）
课程英文名称：	Bioeconomy, Energy Market and Green Market		
课程类别：	硕士公课	课程规格：	选修课程
学分：	3	考试方式：	论文
课程学时：	64	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☑ ☑ ☐ ☐ ☐ ☐ ☐ ☐	上课教师：	徐春东, 于新海
课程构成：			
课程内容简介：	本课程将向学生介绍生物经济基本原则，如何分析能源和环境政策对不同类型生物基产品（特别关注生物能源相关产品）需求和供应的影响。该课程将涵盖整个生物质利用链的经济、市场和政策问题，包括生物质的培养、收获、运输、转化和利用，还将包括废物管理，以考虑对健康、环境和可持续发展的影响。该课程拓展了能源和环境工程领域的必修知识。该课程是欧盟Erasmus+计划BBChina项目（生物相环经济硕士项目：从田野到生物能源、生物燃料和生化制品）建设课程。		
英文内容简介：	This course will provide the principles in understanding the bio-based economy and introduce to the students how to analyze the impacts of energy and environmental policies on the demand and supply of different types of bio-based products, with special focus on bioenergy related products. The course will cover the economics, market and policy issues of the entire chain of the utilization of biomass, including biomass cultivation, harvesting, transportation, conversion and utilization. Waste management will also be included to consider the impacts on health, environment, and sustainable development. The course adds a compulsory knowledge in the field of energy and environment engineering.The course is developed by the Erasmus+ Capacity Building in Higher Education project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina).		
教学大纲：	Introduction to the bioeconomy 3 Class Hours Economic analysis - I: Flow chart and estimating the capital cost and the manufacturing cost 3 Class Hours Economic analysis - II: Profitability analysis 3 Class Hours Economic analysis - III: Life cycle cost 3 Class Hours Business model - I 3 Class Hours Business model - II 3 Class Hours Biomass Market - I 3 Class Hours Biomass Market - II 3 Class Hours Waste management 3 Class Hours Regulations and policies - I: Control of waste and pollutant emissions 3 Class Hours Regulations and policies - II: Incentives strategies 3 Class Hours Standards, Normative and Labels related to Bioenergy and Biobased Products 3 Class Hours Circular economy and Green Market 3 Class Hours GroupProject andPresentation 16 Class Hours		
考试大纲：			
主要参考书目：	1. Shurong Wang, Zhongyang Luo.Pyrolysis of biomass.Science Press,2018. 2. Shijie Liu. Integrated Biorefineries: Design, Analysis, and Optimization.CRC Press, 2012. 3. Ashok Pandey. Handbook of plant-based biofuels. CRC Press, 2009. 4. David M. Mousdale. Biofuels: Biotechnology, Chemistry, and sustainable Development, CRC Press, 2008 5. Ayhan Demirbas. Biodiesel: A realistic fuel alternative for diesel engines. Springer, 2008		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0807FFC011	课程名称：	可再生能源技术（全英文）
课程英文名称：	Renewable Energy Technologies		
课程类别：	硕士课	课程规格：	进修课程
学分：	2	考试方式：	论文
课程学时：	36	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☑ ☑ ☐ ☐ ☐ ☐ ☐ ☐	上课教师：	徐春东，于新海
课程构成：			
课程内容简介：	该课程重点介绍国际上可再生能源生产的主要途径，不同可再生能源技术的原理和工艺，经济技术可行的最佳可再生能源技术，以及可再生能源技术驱动的海水淡化基本知识。该课程是欧盟Erasmus+计划BBChina项目（生物循环经济硕士项目：从田野到生物能源、生物燃料和生化制品）建设课程。		
英文内容简介：	"Renewable Energy Technologies" is a specialized course for master students majoring in Environmental Engineering, Environmental Science, Thermal Engineering. The course focuses on the up-to-date theories and technologies of renewable energy technologies. It presents a wide overview on the most important renewable energy production options, Best Available Technologies for renewable energy, as well as a basic understanding of renewable energy technologies driven desalination and waste management. The course is developed by the Erasmus+ Capacity Building in Higher Education project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina).		
教学大纲：	Introduction: Energy potentials from renewables;fossils and nuclear; reasons for shifting from fossil fuels to renewables in oil and/or gas producing/exporting countries; optimizing energy production 2 Class Hours Solar energy: Solar radiation, solar heat, photovoltaics 4 Class Hours Solar energy: Concentrated solar energy and passive solar energy usage 4 Class Hours Economics, design and applications of a solar energy plant 4 Class Hours Wind energy: Wind resource and measurements 4 Class Hours Wind energy: Basic theory, wind generators 4 Class Hours Wind energy: Components of a wind generator 2 Class Hours Wind energy: Wind park development, wind Energy production 4 Class Hours Waste to energy: Waste definition and classification Waste Management 2 Class Hours Waste to energy: Legal, safety and environmental Issues, economics 2 Class Hours Waste Management 2 Class Hours RES Driven desalination: Desalination basics and technologies, solar thermal energy desalination, hybrid and other RES desalination 2 Class Hours Other renewable energy sources: hydropower and tidal,geothermal 4 Class Hours Grid integration of intermittent energy sources 2 Class Hours Group Project 12 Class Hours		
考试大纲：			
主要参考书目：	Goswami, Y., "Principles of Solar Engineering" - CRC Press Hau, E., "Wind Turbines - Fundamentals, Technologies, Application, Economics" - Springer Kaltschmitt, M., Streicher, W., Wiese, A., "Renewable Energy - Technology, Economics and Environment" - Springer		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0807FFC009	课程名称：	植物发育生物学（全英文）
课程英文名称：	Plant development biology		
课程类别：	硕士生课	课程规格：	进修课程
学分：	3	考试方式：	论文
课程学时：	48	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☑ ☑ ☐ ☐ ☐ ☐ ☐ ☐	上课教师：	子新海,涂善东
课程构成：			
课程内容简介：	植物发育是一个贯穿整个生命周期的连续过程，有相似的调节机制作用于植物的不同阶段和不同部位。本课程将通过介绍如何通过介绍这些基础机制来解释植物细胞如何获得和维持其特定的命运，并利用案例研究向学生介绍植物发育学的理论框架，阐述各种环境和内源因素如何调节发育，从而产生多样植物形态的机理。		
英文内容简介：	Plant development is a continuous process occurring throughout the life cycle, with similar regulatory mechanisms acting at different stages and in different parts of the plant. Thecourse explains how the cells of a plant acquire and maintain their specific fates by structuring around these underlying mechanisms using case studies to provide students with a framework to understand the many factors, both environmental and endogenous, that combine to regulate development and generate the enormous diversity of plant forms.		
教学大纲：	有花植物导论 An Introduction to Flowering Plants. 3 Class hours 植物发育的特点Characteristics of Plant Development. 3 Class hours 细胞的内源信息Cell Intrinsic Information. 3 Class hours 初生轴的发育Primary Axis Development. 6 Class hours 叶和花器官中轴的发育Axis Development in the Leaf and Flower. 6 Class hours 相对于特定细胞、组织或器官的位置Position Relative to a Particular Cell, Tissue or Organ. 6 Class hours 光Light 6 Class hours 除光以外的其他环境信息Environmental Information other than Light. 6 Class hours 发育的协调The Coordination of Development. 3 Class hours 植物和动物发育的比较A Comparison of Plant and Animal Development. 3 Class hours 课堂讨论Course review and discussion 3 Class hours		
考试大纲：			
主要参考书目：	1. Mechanisms in Plant Development , Ottoline Leyser . 2. Plant Growth And Development, Donald E. Fosket 3. Control Mechanisms In Plant Development, Arthur W. Galston		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0807FFC017	课程名称：	固体废弃物热处理与能源化技术
课程英文名称：	Thermal Waste Management and WTE Technologies		
课程类别：	硕士生课	课程规格：	全日制
学分：	2	考试方式：	闭卷考试
课程学时：	42	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☑ ☑ ☐ ☐ ☐ ☐ ☐ ☐	上课教师：	于新海
课程构成：			
课程内容简介：	本课程较全面、系统地介绍固体废弃物热处理和能源转化技术，重点是焚烧、热解与气化。通过本课程的学习让学生系统掌握：典型的废物热处理技术：焚烧、热解与气化的原理，方法与基本计算；典型的焚烧炉型；气化和热解炉；焚烧炉型；气化和热解炉的主要差异；热处理和转化过程中的二次污染物和控制技术。		
英文内容简介：	The course is intended to introduce the typical WtE techologies. Through the study of this course, students are expected to master:i.Typical thermal waste management technologies: incineration, gasification, pyrolysis, the principle, methods and their basic calculations. ii.Typical reactors for incineration; gasification and pyrolysis; the main difference between reactors for incineration; gasification and pyrolysis; iii.Pollutants formation from thermal management processes and their emission control.		
教学大纲：	固废热处理原理与应用 2学时 固废的表征方法和数据处理 2学时 固废处理相关的规则、法规 2学时 废弃物热值和热量计算方法 2学时 废物的收集与源头分类 3学时 废弃物能源化技术：焚烧 2学时 生焚烧烟气净化、焚烧灰渣处置、焚烧炉设计概要 6学时 废弃物能源化技术:热解、热解产物及其利用、热解炉设计概要 6学时 废弃物能源化技术：气化、气化焚烧与气化发电、热化炉设计概要 6学时 废弃物能源化技术的生命周期评价 2学时 讨论和作业：哪种废弃物能源化技术最好？ 3学时 填埋和填埋气体的利用 2学时 填埋气发电 2学时 期末考试 2学时		
考试大纲：			
主要参考书目：	1. 陈德珍等编<废弃物热处理技术>，同济大学出版社，2016 2. 《Waste Management》，ISSN: 0956-053X 3. Reference Document on the Best Available Techniques for Waste Incineration. August 2006. EUROPEAN COMMISSION.		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0S07FFC015	课程名称：	燃烧学
课程英文名称：	Combustion		
课程类别：	硕士生课	课程规格：	全日制
学分：	3	考试方式：	闭卷考试
课程学时：	54	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☑ ☑ ☐ ☐ ☐ ☐ ☐ ☐	上课教师：	于新海
课程构成：	考试+课程报告（Examination+Course report）		
课程内容简介：	本课程较全面、系统地介绍了基本燃烧理论、方法和一些应用，重点介绍了燃料点火、火焰传播、湍流燃烧稳定性、液体燃料和煤燃烧的理论，包括燃烧速率、链式爆燃、湍流燃烧模型、斯蒂芬流通过对火焰稳定性等基本概念和定理的阐述，培养抽象思维和逻辑推理能力的毕业生，提高他们的理论分析能力本课程侧重于对实际背景的数学建模，培养研究生应用数学知识解决实际工程问题，为燃烧技术应用研究奠定坚实的基础。	
英文内容简介：	This course is more comprehensive, systematic introduction to the basic combustion theory, methods, and some applications, focusing on the theories of fuel ignition, flame propagation, stability of turbulent combustion, liquid fuel and coal combustion, which including combustion rate, chain deflagration, turbulent combustion model, Stephen flow, flame stability etc. By clarifying the basic concepts and theorems, this course is to train graduate of abstract thinking and logical reasoning ability and to improve their ability of theoretical analysis. And the course emphasizes on the mathematical modeling of the actual background, which trains graduate applying mathematical knowledge to solve practical engineering problems and to lay a solid foundation for research in combustion technology applications.		
教学大纲：	燃烧科学简史、燃烧科学的应用、燃烧污染、燃烧方法学研究、化学平衡固废热处理原理与应用、热化学 7学时 反应速率理论、有效碰撞理论、阿累尼乌斯定律、反应速率因子、链式反应理论、链条点火 8学时 燃烧过程的热爆燃理论、Semyonov热点火理论、强制点火和自然火灾、火焰传播的基本形式、可燃气体火焰正常传播、 火焰传播速度、动态燃烧和扩散燃烧 6学时 层本火焰传播模式、可燃气体火焰的正常传播、火焰沿向传播理论、火焰传播速度、动态燃烧和扩散燃烧、火焰稳定性方法 10学时 湍流预混合火焰模型、拉伸-切割-和-清式燃烧模型、湍流燃烧平均反应速率 6学时 液体燃料燃烧的基本过程、喷洒方式、喷条均匀度、液滴蒸发斯蒂芬流、强制通风条件下液滴蒸发的转化膜理论、液滴在相对静止环境中的扩散燃烧 6学时 碳初燃烧的Stephen流、碳球燃烧速率、高温下碳球的扩散燃烧、液体燃料煤层本工艺 6学时 期末考试 2学时		
考试大纲：			
主要参考书目：	[1] Cen kefa, Yao qiang, Luo zhongyang, Gao xiang, Combustion Theory and Pollution Control , Machinery Industry Press, 2004 [2] Fu weibiao, Combustion Theory, Higher Education Press, 1989 [3] Zhang songtao, Engineering Combustion, Shanghai Jiaotong University Press, 1987 [4] Xu xuchang, Combustion Theory And Combustion Equiments, Machinery Industry Press, 1990		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0807FFC016	课程名称：	生命周期分析
课程英文名称：	Life Cycle Assessment		
课程类别：	硕士生课	课程规格：	全日制
学分：	3	考试方式：	论文
课程学时：	54	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☐ ☐ ☑ ☑ ☐ ☐ ☐ ☐	上课教师：	于新海
课程构成：	考查+课程报告（Examination+Course report）		
课程内容简介：	生命周期评估（LCA）是一种过程影响评估工具。通过从“摇篮”到“坟墓”的全过程分析，从排放、能耗和经济等角度研究某一产品或行为对环境的影响，从而帮助相关人员做出更准确的决策。本课程将介绍该领域的基本概念、理论和方法以及与循环经济的关系。该课程是欧盟Erasmus+计划BBChina项目（生物循环经济硕士项目：从田野到生物能源、生物燃料和生化制品）建设课程。		
英文内容简介：	Life Cycle Assessment (LCA) is a process impact assessment tool. Through the whole process analysis from “cradle” to “grave”, the impact of a product or behavior on the environment is studied from the perspectives of emissions, energy consumption and economy, thus helping relevant people to make more accurate decisions. This course will introduce the basic concepts, theories and methods in the field and the relationship with the circular economy. The course is developed by the Erasmus+ Capacity Building in Higher Education project “Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China” (BBChina).		
教学大纲：	LCA概述 3学时 目标和范围 3学时 生命周期清单概述 3学时 生命周期清单的计算结构 6学时 生命周期清单的投入和产出 9学时 影响分析 9学时 LCA相关的分析 6学时 LCA在循环经济中的应用 9学时 讨论和报告 6学时		
考试大纲：			
主要参考书目：	摘选期刊论文 Selected articles from: Environmental Science and Technology International Journal of Life Cycle Assessment Journal of Industrial Ecology Journal of Cleaner Production Ecological Economics		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0S07FFC013	课程名称：	生物质能：技术与应用
课程英文名称：	Biomass Energy: Technology and Application		
课程类别：	硕士生课	课程规格：	全日制
学分：	3	考试方式：	闭卷考试
课程学时：	54	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☑ ☑ ☐ ☐ ☐ ☐ ☐ ☐	上课教师：	于新海
课程构成：	考试+课程报告（Examination+Course report）		
课程内容简介：	生物质能技术与应用是面向生物质能、生物工程、应用化学、化学工程与工艺、生物学等专业硕、博士开设的专业课。本课程主要介绍生物质能开发的技术与应用，以及相关学科方向的最新研究进展，涵盖生物质能利用前景、生物质能的发展现状及前景、生物质能生产新技术、生物质能产业发展现状及前景等，使学生了解生物质转化为能源的意义、理论与先进技术，以及产业化运行与前景，有利于学生在生物质能方向开展研究工作。		
英文内容简介：	"Biomass Energy:Technology and Application" is a specialized course for master and Ph.D students majoring in Biomass Energy, Biology Engineering, Applied Chemistry, Chemical Engineering and Technology, Biology Science, etc. The course focuses on the up-to-date theories, technologiesand application of biomass energy. It presents a description of biomass energy production technology, application and resent researches. The course contents include the utilization prospect, the current development, the new production technologyand the commercialization status of biomass energy, etc.Through the study of this course, students are required to masterthe basictheory andtechnology for biomass energy, and to understand the relevantresearch and commercialization trends. The knowledge will help students research in the field of biomass energy.		
教学大纲：	绪论，生物质能简介，生物质能意义与利用前景 3学时 各国生物质能应用现状与前景 3学时 生物质能转化技术：1. 物理转换技术 4学时 生物质能转化技术：2. 生物质直接燃烧技术 4学时 生物质能转化技术：3. 生物质气化技术 4学时 生物质能转化技术：4. 生物质热解与直接液化技术 4学时 生物质能转化技术：5. 生物柴油生产技术 4学时 生物质能转化技术：6. 生物乙醇和生物丁醇生产技术 4学时 生物质能转化技术：7. 生物质制氢技术 4学时 生物质能转化技术：8. 生物沼气生产技术 4学时 生物质实验技术基础 4学时 生物质分析技术 4学时 课堂讨论 4学时 期末考试 4学时		
考试大纲：			
主要参考书目：	1.Shurong Wang, Zhongyang Luo.Pyrolysis of biomass.Science Press,2018. 2.Shijie Liu. Integrated Biorefineries: Design, Analysis, and Optimization.CRC Press, 2012. 3.Ashok Pandey. Handbook of plant-based biofuels. CRC Press, 2009. 4.David M. Mousdale. Biofuels: Biotechnology, Chemistry, and sustainable Development, CRC Press, 2008 5.Ayhan Demirbas. Biodiesel: A realistic fuel alternative for diesel engines. Springer, 2008		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

关闭窗口

操作

输出到Word

注意事项：

有问题请给我写信

研究生课程详细内容

开课学院：**机械与动力工程学院**

课程代码：	004M0S07FFC014	课程名称：	糖化学
课程英文名称：	CarbohydrateChemistry		
课程类别：	硕士生课	课程规格：	全日制
学分：	3	考试方式：	闭卷考试
课程学时：	54	每周学时：	
教师讲授学时：		课堂交流学时：	
实验/实践学时：		先修课程：	
学习单元：	☐ ☐ ☑ ☑ ☐ ☐ ☐ ☐	上课教师：	于新海
课程构成：	考试+课程报告（Examination + Course report）		
课程内容简介：	糖（碳水化合物）是自然界中可再生的一类重要的天然产物，也是重要的工业原料，对人类生活和人类社会可持续发展有独特的意义。“糖化学”课程是面向化学和化工相关专业硕士研究生开设的专业课。本课程将讲授和讨论糖化学的基本知识、相关反应及其机理，介绍糖转化领域最新进展。通过学习，掌握木糖、果糖及葡萄糖的化学惰化转化方法及原理，了解其转化后所得产品的性质和应用，为将来进一步学习生物质转化化学和从事相关领域的工作打下良好的基础。		
英文内容简介：	“Carbohydrate Chemistry” is a specialized course for master students majoring in chemistry and chemical engineering. The course provides an introduction to basic knowledgeof carbohydrates, the related reactions and mechanisms, especially the state-of-the-art technologies of carbohydrate transformation.		
教学大纲：	绪论：糖的来源和基本概念 3学时 单糖的结构、构型、构象和变旋作用 3学时 糖的多官能团化学 3学时 寡糖和多糖 6学时 课堂讨论 3学时 糖在溶剂中的存在形式及其与溶剂的相互作用 3学时 木糖的转化化学 6学时 果糖的转化化学 9学时 葡萄糖的转化化学 6学时 半纤维素的制备、结构特征和转化化学 3学时 纤维素的制备、结构特征和转化化学 3学时 课堂讨论 3学时 期末考试 3学时		
考试大纲：			
主要参考书目：	[1] 孔繁祥. 糖化学. 北京:科学出版社, 2005. (Kong Fanzuo. Chemistry of Sugars. Beijing: Scientific Press, 2005) [2] 张力田，罗志刚. 碳水化合物化学（第二版）. 北京：中国轻工业出版社, 2013. (Zhang Litian, Luo Zhigang. Chemistry of Carbohydrates (1st edition). Beijing: China Light Industry Press, 2013) [3]金征宇，顾正彪等. 碳水化合物化学：原理与应用. 北京：化学工业出版社, 2007. (Jin Zhengyu, Gu Zhengbiao, etc. Chemistry of Carbohydrates: Principles and Applications. Beijing: Chemical Industry Press, 2007) [4] R. V. Stick, S. J. Williams. Carbohydrates: The essential molecules of life (2ndEdition). Elsevier Science, 2008. [5] M. Philippe, J. Auge, Y. Queneau, Carbohydrate Chemistry: Volume 40, Royal Society of Chemistry, 2014.		
备注：			

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

3) July, 2019: The education program for Academic master degree in Mechanical and Power Engineering was approved by Graduate School of ECUST. The program/curriculum is available for master students to select BBChina courses. The following webpages shows the courses that can be seen and selected in the student study plan system.

Co-funded by the Erasmus+ Programme of the European Union

Courses of colleges in Fall Semester 2019

College: 机械与动力工程学院 | 2019 | Fall | All kinds

编号	Course kind	Course College	Course Code	Course Name	Credit	Credit hours	Semester	lecturer	Start & End Weeks	ClassTime 1	Room 1	Class
1	博士生课	机械与动力工程学院	004D080201B002	现代摩擦、磨损及流体润滑理论	2	32	2019Fall	05801安琦	2-10		自排	
2	博士生课	机械与动力工程学院	004D080701B003	流动与传热数值计算	2	32	2019Fall	07342赖焕新	2-10	Tues/9-12	研/506	
3	博士生课	机械与动力工程学院	004D080701B005	高温反应工程	2	32	2019Fall	06941陈雪莉	2-10	Thur/9-12	研/507	
4	博士生课	机械与动力工程学院	004D080701B001	结构完整性原理	2	32	2019Fall	06619轩福贞	11-19		自排	
5	博士生课	机械与动力工程学院	004D080701B002	微纳系统与工程	2	32	2019Fall	06639栾伟玲	11-18		自排	
6	博士生课	机械与动力工程学院	004D080701B006	多相流体动力学	2	32	2019Fall	06247刘海峰	11-19	Thur/9-12	实9/601	
7	硕士生课	机械与动力工程学院	004M080101B004	弹性力学	4	64	2019Fall	06476何录武	2-14	Tues/9-11	研/504	Thur/
8	硕士生课	机械与动力工程学院	004M080201B003	工程摩擦学	2	32	2019Fall	05801安琦	2-10	Tues/9-10	研/507	Fri/9-
9	硕士生课	机械与动力工程学院	004M080201B005	现代控制理论基础	2	32	2019Fall	08306刘爽	2-10	Thur/5-8	研/605	
10	硕士生课	机械与动力工程学院	004M080201B006	工程测试与信号处理	2	32	2019Fall	07005颜建军	2-10	Fri/1-4	实10/306	
11	硕士生课	机械与动力工程学院	004M080201B010	机械动力学	4	64	2019Fall	07004刘长利	2-10	Wed/5-8	研/607	Fri/5-
12	硕士生课	机械与动力工程学院	004M080201C024	现代表面工程	2	32	2019Fall	06588高志	2-10	Mon/1-4	研/507	
13	硕士生课	机械与动力工程学院	004M080201C026	测控系统软件设计方法	2	32	2019Fall	07005颜建军	2-10	Tues/1-4	实10/306	
14	硕士生课	机械与动力工程学院	004M080701B002	现代工程材料	2	32	2019Fall	07075谢林生 07484王国珍	2-10	Thur/7-8	/V/107	Fri/7-
15	硕士生课	机械与动力工程学院	004M080701B003	高等流体力学	2	32	2019Fall	03998苏永升	2-10	Tues/3-4	/V/107	Fri/5-
16	硕士生课	机械与动力工程学院	004M080701B008	高等工程热力学	4	64	2019Fall	07405周嘤彦 06798那改兰	2-19	Mon/5-8	/V/107	
17	硕士生课	机械与动力工程学院	004M080701C029	压力容器安全技术基础1班	1	16	2019Fall	05862施哲雄	2-6	Mon/9-12	/V/101	
18	硕士生课	机械与动力工程学院	004M0807FFC011	生物质能技术与应用（全英文）	3	54	2019Fall	06207涂善东 06251于新海	2-14		自排	
19	硕士生课	机械与动力工程学院	004M0807FFC013	污水处理理论与技术（全英文）	2	36	2019Fall	06207涂善东 06251于新海	2-10		自排	
20	硕士生课	机械与动力工程学院	004M083701B001	安全工程导论	2	32	2019Fall	06791陈继章	2-10	Fri/5-8	研/705	
21	硕士生课	机械与动力工程学院	004M083701B002	设备安全理论与技术	2	32	2019Fall	06291刘长军	2-10	Wed/5-8	研/504	
22	硕士生课	机械与动力工程学院	004M083701B005	无损检测技术及缺陷评价	4	64	2019Fall	03173刘晴岩 06291刘长军	2-19	Fri/1-4	研/705	
23	硕士生课	机械与动力工程学院	004M080701C029	压力容器安全技术基础2班	1	16	2019Fall	05862施哲雄	7-10	Mon/9-12	/V/101	
24	硕士生课	机械与动力工程学院	004M080101B002	塑性力学	2	32	2019Fall	10905乔继彤	11-19	Fri/5-8	研/303	
25	硕士生课	机械与动力工程学院	004M080201B004	机械制造过程监控理论与技术	2	32	2019Fall	06876许虹	11-19	Tues/9-12	研/506	
26	硕士生课	机械与动力工程学院	004M080201C022	计算机三维工程图形应用技术	2	32	2019Fall	06157郭慧	11-19	Thur/5-8	研/703	
27	硕士生课	机械与动力工程学院	004M080201C025	新型传感器技术	2	32	2019Fall	06644钱志勤	11-19	Mon/5-8	研/605	
28	硕士生课	机械与动力工程学院	004M080201C031	虚拟样机技术及其应用	2	32	2019Fall	03021郑建荣	11-19	Tues/1-4	研/707	
29	硕士生课	机械与动力工程学院	004M080201C032	优化设计方法学	2	32	2019Fall	06325周炜	11-19	Mon/1-4	研/507	
30	硕士生课	机械与动力工程学院	004M080201C033	计算机控制及接口技术	2	32	2019Fall	06438刘小成	11-19	Tues/9-10	研/507	Thur/
31	硕士生课	机械与动力工程学院	004M080201C035	机械CAE技术及其应用	2	32	2019Fall	08311贾云飞	11-19	Fri/5-8	研/507	
32	硕士生课	机械与动力工程学院	004M080700C052	论文写作	1	16	2019Fall	05861章兰珠	11-19	Wed/5-8	/V/210	
33	硕士生课	机械与动力工程学院	004M080701C025	高分子材料加工原理	2	32	2019Fall	07075谢林生	11-19	Thur/5-8	研/605	
34	硕士生课	机械与动力工程学院	004M080701C029	压力容器安全技术基础3班	1	16	2019Fall	05862施哲雄	11-14	Mon/9-12	/V/101	
35	硕士生课	机械与动力工程学院	004M083701B003	化工生产防火防爆安全技术	2	32	2019Fall	06792施倬嘉	11-19	Fri/9-12	研/507	
36	全日制专业学位	机械与动力工程学院	004F085201E001	实践教学（机械工程）	4	800	2019Fall	07004刘长利	1-19		自排	
37	全日制专业学位	机械与动力工程学院	004F085206E001	实践教学（动力工程）	4	800	2019Fall	06570惠虎	1-19		自排	
38	全日制专业学位	机械与动力工程学院	004F085206C004	承压设备制造及安全管理	2	32	2019Fall	06291刘长军	2-10	Mon/1-4	研/603	
39	全日制专业学位	机械与动力工程学院	004F085206B001	弹塑性力学基础	2	32	2019Fall	06476何录武	11-19	Wed/9-12	研/504	
40	全日制专业学位	机械与动力工程学院	004F085206B002	材料腐蚀与防护技术	2	32	2019Fall	06660侯峰 07259刘东雷	11-19	Fri/5-8	研/603	
41	全日制专业学位	机械与动力工程学院	004F085206B003	机械设备的检测与诊断	2	32	2019Fall	05054周部萍	11-19	Thur/5-8	研/607	
42	全日制专业学位	机械与动力工程学院	004F085206C001	专业外语	2	32	2019Fall	05054周部萍 07165王卫泽	11-19	Fri/1-4	/V/107	

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

Courses of colleges in Fall Semester 2019

College: 生物工程学院 | 2019 | Fall | All kinds

编号	Course kind	Course College	Course Code	Course Name	Credit	Credit hours	Semester	lecturer	Start & End Weeks	ClassTime 1	Room 1	Class
1	博士生课	生物工程学院	003D071001B001	高级生物化学	3	48	2019Fall	04946魏东芝 07430王凤清	2-18	Thur/3-4	研/603	
2	博士生课	生物工程学院	003D071001B003	生命科学研究进展	2	32	2019Fall	03562张惠展	2-18	Mon/3-4	研/606	
3	博士生课	生物工程学院	003D081703B001	生物反应器的设计与放大	2	32	2019Fall	03558张元兴	2-18	Tues/5-8	自排	
4	博士生课	生物工程学院	003D082201B004	系统代谢工程	2	32	2019Fall	07530花强 08288吴辉	2-18	Wed/3-4	研/603	
5	博士生课	生物工程学院	003D0836FFB001	微生物细胞信号转导	2	32	2019Fall	07399王启要 07909蔡孟浩	2-9	Wed/9-11	研/603	
6	博士生课	生物工程学院	003D0836FFB002	生物工程进展	2	32	2019Fall	07269鲍杰 07896张建	2-9	Fri/5-8	研/603	
7	硕士生课	生物工程学院	003M070701B007	海洋生化工程	2	32	2019Fall	08043万民熙 05683李元广	2-9	Tues/9-12	研/607	
8	硕士生课	生物工程学院	003M071001B006	过程分子生物学	4	64	2019Fall	03562张惠展	2-18	Thur/5-8	/八/110	
9	硕士生课	生物工程学院	003M071001B009	酶学与生物催化	4	64	2019Fall	04946魏东芝 03448赵健	2-18	Tues/3-4	/八/110	Fri/3-
10	硕士生课	生物工程学院	003M0710FFC004	过程分子生物学(全英文)	2	32	2019Fall	06764马景澍	2-18	Thur/5-6	研/506	
11	硕士生课	生物工程学院	003M081703B002	现代生物分离工程	2	32	2019Fall	06829万俊芬	2-9	Mon/5-8	/八/110	
12	硕士生课	生物工程学院	003M081703B011	生物反应器工程	4	64	2019Fall	03372庄英萍 07552夏建业	2-18	Mon/1-4	/八/110	
13	硕士生课	生物工程学院	003M081703B012	生物大分子仪器分析	2	32	2019Fall	07746史萍	2-9	Fri/5-8	/八/110	
14	硕士生课	生物工程学院	003M0817FFB003	生物催化与酶工程（全英文）	2	32	2019Fall	08217全舒 07503都惠蕾	2-18	Wed/3-4	研/604	
15	硕士生课	生物工程学院	003M0817FFB004	生物反应工程（全英文）	2	32	2019Fall	07552夏建业 08392田锡炜	2-18	Wed/5-6	研/604	
16	硕士生课	生物工程学院	003M0817FFC001	生物质能源过程工程（全英文）	2	32	2019Fall	07269鲍杰 07896张建	2-9	Fri/9-11	研/603	
17	硕士生课	生物工程学院	003M083201B003	食品酶学	2	32	2019Fall	06224常雅宁	2-9	Mon/5-8	研/603	
18	硕士生课	生物工程学院	003M083201B007	食品生物技术与工程	4	64	2019Fall	07097谢静莉 07812魏巍	2-18	Thur/5-8	研/606	
19	硕士生课	生物工程学院	003M083201B008	食品安全原理	4	64	2019Fall	07702左鹏	2-18	Fri/1-4	研/606	
20	硕士生课	生物工程学院	003M083201C005	食品碳水化合物及脂类化学	1	16	2019Fall	06807郑国生	2-9	Mon/3-4	研/703	
21	硕士生课	生物工程学院	003M0832FFC001	食品物性学（全英文）	1	16	2019Fall	W0304松川真吾 07097谢静莉	2-18		自排	
22	硕士生课	生物工程学院	003M083601B002	细胞培养工程	2	32	2019Fall	05063周燕	2-9	Tues/1-2	/八/110	Fri/1-
23	硕士生课	生物工程学院	003M083601C003	基因工程制药	2	32	2019Fall	07909蔡孟浩	2-9	Tues/3-4	研/603	Fri/3-
24	硕士生课	生物工程学院	003M071001B008	应用微生物学	2	32	2019Fall	07394胡凤仙	11-18	Mon/5-8	/八/110	
25	硕士生课	生物工程学院	003M071001C005	生物信息学分析与作图实战	1	16	2019Fall	06510欧阳立明	11-18	Tues/5-8	研/603	
26	硕士生课	生物工程学院	003M0710FFC003	生物化学与分子生物学（全英文）	2	32	2019Fall	08313周勉	11-18	Mon/5-8	研/603	
27	硕士生课	生物工程学院	003M081703C009	生物药物分析	2	32	2019Fall	08413安法梁	11-18	Fri/5-8	/八/110	
28	硕士生课	生物工程学院	003M083201C008	食品毒理学进展	1	16	2019Fall	07899刘卫兵	11-18	Tues/3-4	研/703	
29	硕士生课	生物工程学院	003M083601C005	微生物病原与疫苗学	2	32	2019Fall	07399王启要 06452马悦	11-18	Thur/9-11	研/303	
30	全日制专业学位	生物工程学院	003F085238E001	生物工程领域专业实践1（基地）	4	800	2019Fall	03372庄英萍	1-20		自排	
31	全日制专业学位	生物工程学院	003F085238E002	生物工程领域专业实践2（校企融合）	4	800	2019Fall	03372庄英萍	1-20		自排	
32	全日制专业学位	生物工程学院	003F085238B003	发酵工程与技术	2	32	2019Fall	07285郭美锦 07861王泽建	2-9	Mon/5-8	/八/206	
33	全日制专业学位	生物工程学院	003F085238B007	基因工程	2	32	2019Fall	06764马景澍 07430王凤清	2-18	Fri/3-4	研/505	
34	全日制专业学位	生物工程学院	003F085238B001	生化分离工程	2	32	2019Fall	06829万俊芬	11-18	Wed/1-4	/八/206	
35	全日制专业学位	生物工程学院	003F085238B002	生物催化技术与工程	2	32	2019Fall	05656许建和 06828潘江	11-18	Mon/5-8	/八/206	
36	全日制专业学位	生物工程学院	003F085238C001	生工专业英语	2	32	2019Fall	07710韦柳静	11-18	Wed/5-8	/八/206	
37	全日制专业学位	生物工程学院	003F085238C003	药厂GMP管理及生物制药工厂工艺设计概论	2	32	2019Fall	03229唐寅	11-18	Tues/2-4	四多媒	

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this document does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

華東理工大學
EAST CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY

Approval

Dear Sir/Madam at University of Florence,

Ecust approved the syllabus of the following course: Master Program on Bio-based Circular Economy – from Fields to Bioenergy, Biofuel and Bioproducts in China. （华东理工大学同意在华东理工大学开设的“生物循环经济”-中国的生物能源、生物燃料和生物产品硕士生课程的学习计划。）

Signed .....

By Professor Lanzhu Zhang

Vice Dean of School of Mechanical

And Power Engineering

For East China University of Science

and Technology

Signed .....

By Professor Weiling Luan

Vice Dean of Graduate School

For East China University of Science

and Technology

Stamp （盖章）：华东理工大学

中国·上海·梅陇路130号 邮编:200237
130 Meilong Road, Shanghai 200237, China
http://www.ecust.edu.cn

BBChina
Master Program
on Bio-Based Circular Economy

Master Program Approval Procedure SCU

- *the steps followed by SCU for the approval of the Program*
  According to the related regulations in the university, the colleges could fine-tune the study plans before June of each year based on the needs. In generally, college will discuss the application and make decision. The results will be reported to the university and recorded in the related system. In the meantime, the related courses will be added into the system and the student can select them into their training program.

- *the main dates of the steps of the approval*
  1. In order to ensure the smooth implementation of the project, we handed our application reports to the colleges at the end of December, 2018 and college approve them during January of 2019. They signed and stamped on the training program.
  2. In June, we handed application of course adding and course related materials to the college, and they put these information into the university system.

- *the "position" of the BBChina Master Program within the Educational Offer of your Institution*
  Since the BBChina Master Program is a new project to our university, the university need to inspect its effect. So this program is still belonged to a branch of the secondary subjects.

- *List of all the available official documents related to the approval, in attachment:*
  - *The signed and stamped Syllabus*
  - The serial *number of course and the print of the web page of the university course selection system*
  - *Examples of Approved individual training program for four BBChina students*

Co-funded by the Erasmus+ Programme of the European Union

Sichuan University

College of Chemistry

Study Plan for Master Degree in

"Chemistry"

Program on "Bio-Based Circular Economy"

Degree Offered: M.Sc.

Objectives and Learning Outcomes of the Master:

The proposed program is designed to prepare highly-skilled engineers and managers in the biomass to energy and bioproducts chain, who will be able to coordinate the design and implement solutions to solve challenges with respect to technical, economic, environmental, and ecological constraints. Therefore, this master program will cover the topics, such as energy conversion technologies, including different biochemical routes, system design and optimization from both technical and economical perspectives, project management, legal restrictions and also aspects of climate change, pollution and the integration of renewable energies.

The Program will additionally be fostered through lectures oriented to the development of entrepreneurship skills for sustainable business growth.

The master program is set-up and organised within the ERASMUS+ Project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina), co-funded by the European Union.

The program belongs to the College of Chemistry.

I. Program Objectives

To prepare highly qualified engineers, managers, researchers and high-level operators in the field of biomass to energy and bioproducts, that will be able to complexly apply the acquired knowledge to form, assess and make effective decisions on biomass based projects, on the basis of scientific argumentations. The graduate will be able to follow the complex biomass to energy and bioproducts chain, to optimise each step of the chain and choose the adequate technology for every different step. The graduate will also be able to select the best conversion route for each raw material considered as the starting point, and will be able to deal with the technology, market and regulation issues and to operate within the green market. Furthermore, the graduate

will have the necessary entrepreneurship knowledge and skills to start-up his/her own biomass based activity.

II. Acquired Competences, Abilities and Skills:

- In-depth knowledge of the biomass and raw material provision sources and routes, including agricultural and forestry practices as well as algae production methodologies.
- In-depth knowledge of waste to energy technologies and waste management.
- In-depth knowledge of the biomass to energy chain issues, including logistics.
- In-depth knowledge in the biomass to energy conversion technologies, and their fundamental thermochemical, biological, chemical and other technological concepts.
- In-depth knowledge of the main biomass to energy plant typologies.
- In-depth knowledge of the chemistry basis of the biofuel production, and related technologies from 1st generation to 4th generation biofuels.
- In-depth knowledge of the biorefinery concept, and of the routes for bioproducts production including bioplastics, biochemicals, soil amendments, building materials, pharmaceuticals etc.
- In-depth knowledge in the bio-based economy, market and policy issues.
- Advanced knowledge in other energy conversion technologies (including renewable energy technologies "other" than biomass) and energy efficiency.
- Advanced knowledge of the legislative and support strategies to rule and foster the renewable energy development, with a special focus on the bioenergy chain.
- Advanced Knowledge in the Green Market strategies.
- Advanced knowledge in the environmental issues related to energy production, sustainability and Life Cycle Assessment concept and tools.
- Advanced knowledge in the Secondary Pollution Control Issues related to biomass production and use.
- Advanced Knowledge in the renewable electricity integration in the grid.
- Ability to develop and implement strategies to address major challenges in the biomass to energy chain.
- Ability to merge knowledge from multi-disciplinary fields to design, develop and assess new solutions for biomass to energy and bioproducts challenges.
- Ability to tackle issues in the design of the biomass to energy and bioproducts conversion routes.
- Ability to develop market strategies for bioproducts.
- Ability to analyse and improve a biorefinery process.
- Advanced Entrepreneurial skills.
- Ability to pursue a Ph.D. degree.

General Rules and Conditions:

The proposed program is designed to last 2.5 years.

I. Areas of specialty for admission to the M.Sc. Program:

Holders of the bachelor's degree in:

- Chemistry

Study Plan:

This Study Plan is equivalent to 120 ECTS (European Credit Transfer and Accumulation System) distributed as follows:

	Chinese Credits / Hours	ECTS	Notes	Year
Public Courses	10/177	*Not applicable*	Courses such as "*Foreign language*", "*Dialectics of Nature*" and "*Theory and Practice of Socialism with Chinese Characteristics*"	**YEAR 1**
Degree Courses	9/162	18	These are the courses that are necessary to get the *"Degree in"*	
BBChina Obligatory Courses	9/162	18	These are the obligatory courses of the BBChina	
BBChina Elective Courses	12/216	24	These are the elective courses of the BBChina	
Project + entrepreneurship + Traineeship/internship Master Thesis		30	Entrepreneurship Course, Project elaboration, Traineeship/Internship	**YEAR 2 & First half YEAR 3**
		30	Master Thesis	
Total:		**120**		

Details of the Courses:

I. Public Courses (177 Credit Hours / No equivalence in ECTS):

Course Title	Credits / Hours	ECTS
The First Foreign Language	4/90	
The Theory and Practice of Socialism with Chinese Characteristics	2/36	
Dialectics of Nature	1/18	
Postgraduate Comprehensive Quality Series	1/18	
Academic Exchange Activities	2/15	

II. Degree Courses (162 Credit Hours to be chosen/ 18 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Advanced chemistry experiments	3/54	6
Modern instrumental analysis	3/54	6
Advanced synthetic chemistry	3/54	6
Elementary quantum chemistry	3/54	6

III. BBChina Obligatory Courses (162 Credit Hours / 18 ECTS):

Course Title	Credits / Hours	ECTS
Plant development biology	3/54	6
Biomass energy technology and application	3/54	6
Chemistry of carbohydrates	3/54	6

IV. BBChina Elective Courses (216 Credit Hours to be chosen/ 24 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Biological resources and natural product chemistry	3/54	6
Meta-Omics	3/54	6
Bioreactor Engineering	3/54	6
Biomass process engineering for bioenergy production	3/54	6
Integrated Solid Waste Management and Reuse	3/54	6
Wastewater Treatment: Principles and Technology	3/54	6
Policy (Life cycle analysis)	3/54	6
Renewable Energy Technologies	3/54	6
Bioeconomy, Energy Market and Green Market	3/54	6

V. Development of entrepreneurial Skills (Supporting E&T action / XX credits)

The learning activities related to the promotion of the entrepreneurial spirit will focus on the development of the following skills: self-branding, team building, creative thinking/analytical thinking, resilience, leadership, market, gaining the customer perspective, lean start-up, economic and financial planning, design thinking for start-up, how to prepare a pitch, patent, market, value proposition, and understanding the mechanisms of investment of a venture capital and grants.

VI. Project Development (X Credit Hours/ 30 ECTS):

Description of the Project assignment rules / period / dates

The project assignment will be combined with thesis work (1 year after enrolment). Each master student should participate in the professional practice and the relevant research projects for the thesis needs. Graduate students are required to submit thesis proposal and write a professional practice summary report.

VII. Master Thesis (X Credit Hours/ 30 ECTS):

Rules of the Master Thesis / period / dates

A Master's thesis should be carried out by the student independently under the guidance of his/her mentor or advisor, 1 year after enrolment. The time for the thesis work from the date of the approval of thesis proposal (1-1.5 years after enrolment) should not be less than 1 year in principle. The maximum length of thesis work with course learning together at school must not exceed 4 years. The general procedures for Master thesis are: literature reading and critical review →thesis proposal→ scientific research → writing thesis → thesis defence.

The Master's degree certification will be awarded only for the students who have satisfactorily completed all the coursework and thesis requirements and those who meet the requirement of Regulations Concerning Academic Degree in the People's Republic of China. Students who have completed the coursework requirements but have failed to complete the thesis requirement will be provided a certification for completing the coursework only. At least one publication in an academic journal or academic conference is to be made from a thesis.

The evaluation of the thesis should follow the following procedures:

(i) Evaluation made by the adviser and modification made by the student.

(ii) Deliver the thesis to two experts (professors or associate professors, advisor is excluded) for peer review one month before the defence.

(iii) Obtain permission for the thesis defence. Thesis defence can be done only after the thesis review by the two experts is passed.

Copyright Notice

Sichuan University

School of Chemical Engineering

Study Plan for Master Degree in

"Biochemical Engineering"

Program on "Bio-Based Circular Economy"

Degree Offered: M.Sc.

Objectives and Learning Outcomes of the Master:

The proposed program is designed to prepare highly-skilled engineers and managers in the biomass to energy and bioproducts chain, who will be able to coordinate the design and implement solutions to solve challenges with respect to technical, economic, environmental, and ecological constraints. Therefore, this master program will cover the topics, such as energy conversion technologies, including different biochemical routes, system design and optimization from both technical and economical perspectives, project management, legal restrictions and also aspects of climate change, pollution and the integration of renewable energies.

The Program will additionally be fostered through lectures oriented to the development of entrepreneurship skills for sustainable business growth.

The master program is set-up and organised within the ERASMUS+ Project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina), co-funded by the European Union.

The program belongs to the School of Chemical Engineering.

I. Program Objectives

To prepare highly qualified engineers, managers, researchers and high-level operators in the field of biomass to energy and bioproducts, that will be able to complexly apply the acquired knowledge to form, assess and make effective decisions on biomass based projects, on the basis of scientific argumentations. The graduate will be able to follow the complex biomass to energy and bioproducts chain, to optimise each step of the chain and choose the adequate technology for every different step. The graduate will also be able to select the best conversion route for each raw material considered as the starting point, and will be able to deal with the technology, market and regulation issues and to operate within the green market. Furthermore, the graduate

Shengwei Tang

Annex III

will have the necessary entrepreneurship knowledge and skills to start-up his/her own biomass based activity.

II. Acquired Competences, Abilities and Skills:

- In-depth knowledge of the biomass and raw material provision sources and routes, including agricultural and forestry practices as well as algae production methodologies.
- In-depth knowledge of waste to energy technologies and waste management.
- In-depth knowledge of the biomass to energy chain issues, including logistics.
- In-depth knowledge in the biomass to energy conversion technologies, and their fundamental thermochemical, biological, chemical and other technological concepts.
- In-depth knowledge of the main biomass to energy plant typologies.
- In-depth knowledge of the chemistry basis of the biofuel production, and related technologies from 1st generation to 4th generation biofuels.
- In-depth knowledge of the biorefinery concept, and of the routes for bioproducts production including bioplastics, biochemicals, soil amendments, building materials, pharmaceuticals etc.
- In-depth knowledge in the bio-based economy, market and policy issues.
- Advanced knowledge in other energy conversion technologies (including renewable energy technologies "other" than biomass) and energy efficiency.
- Advanced knowledge of the legislative and support strategies to rule and foster the renewable energy development, with a special focus on the bioenergy chain.
- Advanced Knowledge in the Green Market strategies.
- Advanced knowledge in the environmental issues related to energy production, sustainability and Life Cycle Assessment concept and tools.
- Advanced knowledge in the Secondary Pollution Control Issues related to biomass production and use.
- Advanced Knowledge in the renewable electricity integration in the grid.
- Ability to develop and implement strategies to address major challenges in the biomass to energy chain.
- Ability to merge knowledge from multi-disciplinary fields to design, develop and assess new solutions for biomass to energy and bioproducts challenges.
- Ability to tackle issues in the design of the biomass to energy and bioproducts conversion routes.
- Ability to develop market strategies for bioproducts.
- Ability to analyse and improve a biorefinery process.
- Advanced Entrepreneurial skills.
- Ability to pursue a Ph.D. degree.

General Rules and Conditions:

The proposed program is designed to last 2.5 years.

I. Areas of specialty for admission to the M.Sc. Program:

Holders of the bachelor's degree in:

- Chemical Engineering

Study Plan:

This Study Plan is equivalent to 120 ECTS (European Credit Transfer and Accumulation System) distributed as follows:

	Chinese Credits / Hours	ECTS	Notes	Year
Public Courses	10/177	*Not applicable*	Courses such as "*Foreign language*", "*Dialectics of Nature*" and "*Theory and Practice of Socialism with Chinese Characteristics*"	**YEAR 1**
Degree Courses	6/108	18	These are the courses that are necessary to get the *"Degree in"*	
BBChina Obligatory Courses	9/162	18	These are the obligatory courses of the BBChina	
BBChina Elective Courses	12/216	24	These are the elective courses of the BBChina	
Project + entrepreneurship + Traineeship/internship Master Thesis		30	Entrepreneurship Course, Project elaboration, Traineeship/Internship	**YEAR 2 & First half YEAR 3**
		30	Master Thesis	
Total:		**120**		

Shengwei Tang

Details of the Courses:

I. Public Courses (177 Credit Hours / No equivalence in ECTS):

Course Title	Credits / Hours	ECTS
The First Foreign Language	4/90	
The Theory and Practice of Socialism with Chinese Characteristics	2/36	
Dialectics of Nature	1/18	
Postgraduate Comprehensive Quality Series	1/18	
Academic Exchange Activities	2/15	

II. Degree Courses (108 Credit Hours to be chosen/ 18 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Chemical transport phenomena	3/54	9
Chemical engineering thermodynamics	3/54	9
New technologies for pharmaceutical and biological separation	3/54	9
Experimental design and data analysis	3/54	9
Advanced organic chemistry	3/54	9
Computational chemistry	3/54	9

III. BBChina Obligatory Courses (162 Credit Hours / 18 ECTS):

Course Title	Credits / Hours	ECTS
Plant development biology	3/54	6
Biomass energy technology and application	3/54	6
Chemistry of carbohydrates	3/54	6

IV. BBChina Elective Courses (216 Credit Hours to be chosen/ 24 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Biological resources and natural product chemistry	3/54	6
Meta-Omics	3/54	6
Bioreactor Engineering	3/54	6
Biomass process engineering for bioenergy production	3/54	6
Integrated Solid Waste Management and Reuse	3/54	6
Wastewater Treatment: Principles and Technology	3/54	6
Policy (Life cycle analysis)	3/54	6
Renewable Energy Technologies	3/54	6

Shengwei Tang

Bioeconomy, Energy Market and Green Market	3/54	6

V. Development of entrepreneurial Skills (Supporting E&T action / XX credits)

The learning activities related to the promotion of the entrepreneurial spirit will focus on the development of the following skills: self-branding, team building, creative thinking/analytical thinking, resilience, leadership, market, gaining the customer perspective, lean start-up, economic and financial planning, design thinking for start-up, how to prepare a pitch, patent, market, value proposition, and understanding the mechanisms of investment of a venture capital and grants.

VI. Project Development (X Credit Hours/ 30 ECTS):

Description of the Project assignment rules / period / dates

The project assignment will be combined with thesis work (1 year after enrolment). Each master student should participate in the professional practice and the relevant research projects for the thesis needs. Graduate students are required to submit thesis proposal and write a professional practice summary report.

VII. Master Thesis (X Credit Hours/ 30 ECTS):

Rules of the Master Thesis / period / dates

A Master's thesis should be carried out by the student independently under the guidance of his/her mentor or advisor, 1 year after enrolment. The time for the thesis work from the date of the approval of thesis proposal (1-1.5 years after enrolment) should not be less than 1 year in principle. The maximum length of thesis work with course learning together at school must not exceed 4 years. The general procedures for Master thesis are: literature reading and critical review →thesis proposal→ scientific research → writing thesis → thesis defence.

The Master's degree certification will be awarded only for the students who have satisfactorily completed all the coursework and thesis requirements and those who meet the requirement of Regulations Concerning Academic Degree in the People's Republic of China. Students who have completed the coursework requirements but have failed to complete the thesis requirement will be provided a certification for completing the coursework only. At least one publication in an academic journal or academic conference is to be made from a thesis.

The evaluation of the thesis should follow the following procedures:

(i) Evaluation made by the adviser and modification made by the student.

(ii) Deliver the thesis to two experts (professors or associate professors, advisor is excluded) for peer review one month before the defence.

(iii) Obtain permission for the thesis defence. Thesis defence can be done only after the thesis review by the two experts is passed.

Shengwei Tang

Copyright Notice

Sichuan University

Institution of New Energy and Low-Carbon Technology

Study Plan for Master Degree in "Biomass Energy Under Biology" Program on "Bio-Based Circular Economy"

Degree Offered: M.Sc.

Objectives and Learning Outcomes of the Master:

The proposed program is designed to prepare highly-skilled engineers and managers in the biomass to energy and bioproducts chain, who will be able to coordinate the design and implement solutions to solve challenges with respect to technical, economic, environmental, and ecological constraints. Therefore, this master program will cover the topics, such as energy conversion technologies, including different biochemical routes, system design and optimization from both technical and economical perspectives, project management, legal restrictions and also aspects of climate change, pollution and the integration of renewable energies.

The Program will additionally be fostered through lectures oriented to the development of entrepreneurship skills for sustainable business growth.

The master program is set-up and organised within the ERASMUS+ Project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina), co-funded by the European Union.

The program belongs to the Institution of New Energy and Low-Carbon Technologies Technology Institution of New Energy and Low-Carbon Technology.

I. Program Objectives

To prepare highly qualified engineers, managers, researchers and high-level operators in the field of biomass to energy and bioproducts, that will be able to complexly apply the acquired knowledge to form, assess and make effective decisions on biomass based projects, on the basis of scientific argumentations. The graduate will be able to follow the complex biomass to energy

and bioproducts chain, to optimise each step of the chain and choose the adequate technology for every different step. The graduate will also be able to select the best conversion route for each raw material considered as the starting point, and will be able to deal with the technology, market and regulation issues and to operate within the green market. Furthermore, the graduate will have the necessary entrepreneurship knowledge and skills to start-up his/her own biomass based activity.

II. Acquired Competences, Abilities and Skills:

- In-depth knowledge of the biomass and raw material provision sources and routes, including agricultural and forestry practices as well as algae production methodologies.
- In-depth knowledge of waste to energy technologies and waste management.
- In-depth knowledge of the biomass to energy chain issues, including logistics.
- In-depth knowledge in the biomass to energy conversion technologies, and their fundamental thermochemical, biological, chemical and other technological concepts.
- In-depth knowledge of the main biomass to energy plant typologies.
- In-depth knowledge of the chemistry basis of the biofuel production, and related technologies from 1st generation to 4th generation biofuels.
- In-depth knowledge of the biorefinery concept, and of the routes for bioproducts production including bioplastics, biochemicals, soil amendments, building materials, pharmaceuticals etc.
- In-depth knowledge in the bio-based economy, market and policy issues.
- Advanced knowledge in other energy conversion technologies (including renewable energy technologies "other" than biomass) and energy efficiency.
- Advanced knowledge of the legislative and support strategies to rule and foster the renewable energy development, with a special focus on the bioenergy chain.
- Advanced Knowledge in the Green Market strategies.
- Advanced knowledge in the environmental issues related to energy production, sustainability and Life Cycle Assessment concept and tools.
- Advanced knowledge in the Secondary Pollution Control Issues related to biomass production and use.
- Advanced Knowledge in the renewable electricity integration in the grid.
- Ability to develop and implement strategies to address major challenges in the biomass to energy chain.
- Ability to merge knowledge from multi-disciplinary fields to design, develop and assess new solutions for biomass to energy and bioproducts challenges.
- Ability to tackle issues in the design of the biomass to energy and bioproducts conversion routes.
- Ability to develop market strategies for bioproducts.
- Ability to analyse and improve a biorefinery process.
- Advanced Entrepreneurial skills.
- Ability to pursue a Ph.D. degree.

General Rules and Conditions:

The proposed program is designed to last 2.5 years.

I. Areas of specialty for admission to the M.Sc. Program:

Holders of the bachelor's degree in:

-
- Biology

Study Plan:

This Study Plan is equivalent to 120 ECTS (European Credit Transfer and Accumulation System) distributed as follows:

	Chinese Credits / Hours	ECTS	Notes	Year
Public Courses	10/177	*Not applicable*	Courses such as "*Foreign language*", "*Dialectics of Nature*" and "*Theory and Practice of Socialism with Chinese Characteristics*"	**YEAR 1**
Degree Courses	9/162	18	These are the courses that are necessary to get the *"Degree in"*	
BBChina Obligatory Courses	9/162	18	These are the obligatory courses of the BBChina	
BBChina Elective Courses	12/216	24	These are the elective courses of the BBChina	
Project + entrepreneurship + Traineeship/internship Master Thesis		30	Entrepreneurship Course, Project elaboration, Traineeship/Internship	**YEAR 2 & First half YEAR 3**
		30	Master Thesis	
Total:		**120**		

Details of the Courses:

I. Public Courses (177 Credit Hours / No equivalence in ECTS):

Course Title	Credits / Hours	ECTS
The First Foreign Language	4/90	
The Theory and Practice of Socialism with Chinese Characteristics	2/36	
Dialectics of Nature	1/18	
Postgraduate Comprehensive Quality Series	1/18	
Academic Exchange Activities	2/15	

II. Degree Courses (162 Credit Hours to be chosen/ 18 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Advanced microbiology	3/54	6
Basic of biomass energy	3/54	6
Biomass technology	3/54	6
Biomass Resources	3/54	6
Energy biotechnology	3/54	6

III. BBChina Obligatory Courses (162 Credit Hours / 18 ECTS):

Course Title	Credits / Hours	ECTS
Plant development biology	3/54	6
Biomass energy technology and application	3/54	6
Chemistry of carbohydrates	3/54	6

IV. BBChina Elective Courses (216 Credit Hours to be chosen/ 24 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Biological resources and natural product chemistry	3/54	6
Meta-Omics	3/54	6
Bioreactor Engineering	3/54	6
Biomass process engineering for bioenergy production	3/54	6
Integrated Solid Waste Management and Reuse	3/54	6
Wastewater Treatment: Principles and Technology	3/54	6
Policy (Life cycle analysis)	3/54	6
Renewable Energy Technologies	3/54	6
Bioeconomy, Energy Market and Green Market	3/54	6

V. Development of entrepreneurial Skills (Supporting E&T action / XX credits)

The learning activities related to the promotion of the entrepreneurial spirit will focus on the development of the following skills: self-branding, team building, creative thinking/analytical thinking, resilience, leadership, market, gaining the customer perspective, lean start-up, economic and financial planning, design thinking for start-up, how to prepare a pitch, patent, market, value proposition, and understanding the mechanisms of investment of a venture capital and grants.

VI. Project Development (X Credit Hours/ 30 ECTS):

Description of the Project assignment rules / period / dates

The project assignment will be combined with thesis work (1 year after enrolment). Each master student should participate in the professional practice and the relevant research projects for the thesis needs. Graduate students are required to submit thesis proposal and write a professional practice summary report.

VII. Master Thesis (X Credit Hours/ 30 ECTS):

Rules of the Master Thesis / period / dates

A Master's thesis should be carried out by the student independently under the guidance of his/her mentor or advisor, 1 year after enrolment. The time for the thesis work from the date of the approval of thesis proposal (1-1.5 years after enrolment) should not be less than 1 year in principle. The maximum length of thesis work with course learning together at school must not exceed 4 years. The general procedures for Master thesis are: literature reading and critical review →thesis proposal→ scientific research → writing thesis → thesis defence.

The Master's degree certification will be awarded only for the students who have satisfactorily completed all the coursework and thesis requirements and those who meet the requirement of Regulations Concerning Academic Degree in the People's Republic of China. Students who have completed the coursework requirements but have failed to complete the thesis requirement will be provided a certification for completing the coursework only. At least one publication in an academic journal or academic conference is to be made from a thesis.

The evaluation of the thesis should follow the following procedures:

(i) Evaluation made by the adviser and modification made by the student.

(ii) Deliver the thesis to two experts (professors or associate professors, advisor is excluded) for peer review one month before the defence.

(iii) Obtain permission for the thesis defence. Thesis defence can be done only after the thesis review by the two experts is passed.

(iv) Thesis defence and obtain permission from the thesis jury (Thesis Committee), which should consist of 3-5 professors or associate professors.

Copyright Notice

Sichuan University

College of Life Sciences

Study Plan for Master Degree in Biology

Program on "Bio-Based Circular Economy"

Degree Offered: M.Sc.

Objectives and Learning Outcomes of the Master:

The proposed program is designed to prepare highly-skilled engineers and managers in the biomass to energy and bioproducts chain, who will be able to coordinate the design and implement solutions to solve challenges with respect to technical, economic, environmental, and ecological constraints. Therefore, this master program will cover the topics, such as energy conversion technologies, including different biochemical routes, system design and optimization from both technical and economical perspectives, project management, legal restrictions and also aspects of climate change, pollution and the integration of renewable energies.

The Program will additionally be fostered through lectures oriented to the development of entrepreneurship skills for sustainable business growth.

The master program is set-up and organised within the ERASMUS+ Project "Master Program on Bio-Based Circular Economy: From Fields to Bioenergy, Biofuel and Bioproducts in China" (BBChina), co-funded by the European Union.

The program belongs to the College of Life Sciences.

I. Program Objectives

To prepare highly qualified engineers, managers, researchers and high-level operators in the field of biomass to energy and bioproducts, that will be able to complexly apply the acquired knowledge to form, assess and make effective decisions on biomass based projects, on the basis of scientific argumentations. The graduate will be able to follow the complex biomass to energy and bioproducts chain, to optimise each step of the chain and choose the adequate technology for every different step. The graduate will also be able to select the best conversion route for each raw material considered as the starting point, and will be able to deal with the technology, market and regulation issues and to operate within the green market. Furthermore, the graduate will have the necessary entrepreneurship knowledge and skills to start-up his/her own biomass based activity.

Yun Zhao

II. Acquired Competences, Abilities and Skills:

- In-depth knowledge of the biomass and raw material provision sources and routes, including agricultural and forestry practices as well as algae production methodologies.
- In-depth knowledge of waste to energy technologies and waste management.
- In-depth knowledge of the biomass to energy chain issues, including logistics.
- In-depth knowledge in the biomass to energy conversion technologies, and their fundamental thermochemical, biological, chemical and other technological concepts.
- In-depth knowledge of the main biomass to energy plant typologies.
- In-depth knowledge of the chemistry basis of the biofuel production, and related technologies from 1st generation to 4th generation biofuels.
- In-depth knowledge of the biorefinery concept, and of the routes for bioproducts production including bioplastics, biochemicals, soil amendments, building materials, pharmaceuticals etc.
- In-depth knowledge in the bio-based economy, market and policy issues.
- Advanced knowledge in other energy conversion technologies (including renewable energy technologies "other" than biomass) and energy efficiency.
- Advanced knowledge of the legislative and support strategies to rule and foster the renewable energy development, with a special focus on the bioenergy chain.
- Advanced Knowledge in the Green Market strategies.
- Advanced knowledge in the environmental issues related to energy production, sustainability and Life Cycle Assessment concept and tools.
- Advanced knowledge in the Secondary Pollution Control Issues related to biomass production and use.
- Advanced Knowledge in the renewable electricity integration in the grid.
- Ability to develop and implement strategies to address major challenges in the biomass to energy chain.
- Ability to merge knowledge from multi-disciplinary fields to design, develop and assess new solutions for biomass to energy and bioproducts challenges.
- Ability to tackle issues in the design of the biomass to energy and bioproducts conversion routes.
- Ability to develop market strategies for bioproducts.
- Ability to analyse and improve a biorefinery process.
- Advanced Entrepreneurial skills.
- Ability to pursue a Ph.D. degree.

Yun Zhao

General Rules and Conditions:

The proposed program is designed to last 2.5 years.

I. Areas of specialty for admission to the M.Sc. Program:

Holders of the bachelor's degree in:

- Biology

Study Plan:

This Study Plan is equivalent to 120 ECTS (European Credit Transfer and Accumulation System) distributed as follows:

	Chinese Credits / Hours	ECTS	Notes	Year
Public Courses	10/177	*Not applicable*	Courses such as "*Foreign language*", "*Dialectics of Nature*" and "*Theory and Practice of Socialism with Chinese Characteristics*"	**YEAR 1**
Degree Courses	8/144	18	These are the courses that are necessary to get the *"Degree in"*	
BBChina Obligatory Courses	9/162	18	These are the obligatory courses of the BBChina	
BBChina Elective Courses	12/216	24	These are the elective courses of the BBChina	
Project + entrepreneurship + Traineeship/internship		30	Entrepreneurship Course, Project elaboration, Traineeship/Internship	**YEAR 2 & First half YEAR 3**
Master Thesis		30	Master Thesis	
Total:		**120**		

Yun Zhao

Details of the Courses:

I. Public Courses (177 Credit Hours / No equivalence in ECTS):

Course Title	Credits / Hours	ECTS
The First Foreign Language	4/90	
The Theory and Practice of Socialism with Chinese Characteristics	2/36	
Dialectics of Nature	1/18	
Postgraduate Comprehensive Quality Series	1/18	
Academic Exchange Activities	2/15	

II. Degree Courses (144 Credit Hours to be chosen/ 18 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Microcosmic Biology	4/72	9
Macrobiology	4/72	9
Biostatistics and Data Analysis	4/72	9

III. BBChina Obligatory Courses (162 Credit Hours / 18 ECTS):

Course Title	Credits / Hours	ECTS
Plant development biology	3/54	6
Biomass energy technology and application	3/54	6
Chemistry of carbohydrates	3/54	6

IV. BBChina Elective Courses (216 Credit Hours to be chosen/ 24 ECTS to be chosen):

Course Title	Credits / Hours	ECTS
Biological resources and natural product chemistry	3/54	6
Meta-Omics	3/54	6
Bioreactor Engineering	3/54	6
Biomass process engineering for bioenergy production	3/54	6
Integrated Solid Waste Management and Reuse	3/54	6
Wastewater Treatment: Principles and Technology	3/54	6
Policy (Life cycle analysis)	3/54	6
Renewable Energy Technologies	3/54	6
Bioeconomy, Energy Market and Green Market	3/54	6

Yun Zhao

V. Development of entrepreneurial Skills (Supporting E&T action / XX credits)

The learning activities related to the promotion of the entrepreneurial spirit will focus on the development of the following skills: self-branding, team building, creative thinking/analytical thinking, resilience, leadership, market, gaining the customer perspective, lean start-up, economic and financial planning, design thinking for start-up, how to prepare a pitch, patent, market, value proposition, and understanding the mechanisms of investment of a venture capital and grants.

VI. Project Development (X Credit Hours/ 30 ECTS):

Description of the Project assignment rules / period / dates

The project assignment will be combined with thesis work (1 year after enrolment). Each master student should participate in the professional practice and the relevant research projects for the thesis needs. Graduate students are required to submit thesis proposal and write a professional practice summary report.

VII. Master Thesis (X Credit Hours/ 30 ECTS):

Rules of the Master Thesis / period / dates

A Master's thesis should be carried out by the student independently under the guidance of his/her mentor or advisor, 1 year after enrolment. The time for the thesis work from the date of the approval of thesis proposal (1-1.5 years after enrolment) should not be less than 1 year in principle. The maximum length of thesis work with course learning together at school must not exceed 4 years. The general procedures for Master thesis are: literature reading and critical review →thesis proposal→ scientific research → writing thesis → thesis defence.

The Master's degree certification will be awarded only for the students who have satisfactorily completed all the coursework and thesis requirements and those who meet the requirement of Regulations Concerning Academic Degree in the People's Republic of China. Students who have completed the coursework requirements but have failed to complete the thesis requirement will be provided a certification for completing the coursework only. At least one publication in an academic journal or academic conference is to be made from a thesis.

The evaluation of the thesis should follow the following procedures:

(i) Evaluation made by the adviser and modification made by the student.

(ii) Deliver the thesis to two experts (professors or associate professors, advisor is excluded) for peer review one month before the defence.

(iii) Obtain permission for the thesis defence. Thesis defence can be done only after the thesis review by the two experts is passed.

Yun Zhao

Copyright Notice

Lectures and Course materials, including power point presentations, tests, outlines, and similar materials, are protected by copyright. The ERASMUS+ "BBChina" consortium is the exclusive owner of copyright in those materials. You may take notes and make copies of course materials for your own use. You may not and may not allow others to reproduce or distribute lecture notes and course materials publicly whether or not a fee is charged, without the Project's express written consent.

Yun Zhao

课程查询 教师组

课程查询

切换到高级查询

课程 M07101006 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索

清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M07101006	生物经济、能源市场和...	新能源与低碳...	新能源与低碳...	考查	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M08170310 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索

清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M08170310	生物质能：技术与应用	化学工程学院	化学工程学院	考试	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M08170504 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M08170504	生物能源过程工程	化学工程学院	生命科学学院...	考试	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M08170503 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M08170503	生物反应器工程	化学工程学院	化学工程学院	考试	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M0703Z102 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M0703Z102	糖化学	化学学院	化学学院	考试	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 燃烧学 开课单位 请选择... 课程层次 硕士课程

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M0817Z401	燃烧学基础	化学工程学院	化学工程学院	考试	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M0703Z104 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M0703Z104	全过程固体废物管理	化学学院	化学学院	考查	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M07101003 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M07101003	生命周期影响分析	生命科学学院	生命科学学院	考查	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M07100104 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M07100104	植物发育生物学	生命科学学院	生命科学学院	考查	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M07101005 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M07101005	可再生能源技术	新能源与低碳...	新能源与低碳...	考查	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

课程查询 教师组

课程查询

切换到高级查询

课程 M0703Z105 开课单位 化学学院,生命科学学... 课程层次 请选择...

课程分类 请选择... 课程标签 请选择... 课程性质 请选择...

对应一级学科 请选择... 承担单位 请选择...

搜索 清空条件 | 更多条件 收起 >

自定义列 列表 卡片

操作	课程代码	课程名称	开课单位	承担单位	考试类型	课程分类	课程层次	上课方式	学
详情	M0703Z105	污水处理理论与技术	化学学院	化学学院	考试	全日制	硕士课程	讲授	

1-1 总记录数 1 跳转至 1 页

Sichuan University Graduate Individual Training Program

Grade：2019 Student ID：2019222030152 Name：Xiaomei Lei Tutor：Dan Li

College: College of Chemical Engineering Discipline ID：085216 Professional Name: Chemical Engneering

Course category	Course number	Course Title	semester	credit	Course level
Compulsory course	G00000301	Academic exchange activities	1	2	master's course
Compulsory course	G00000302	Graduate Comprehensive Quality Series	1	1	master's course
Compulsory course	G00000305	Academic norms and postgraduate thesis writing guidance	1	1	master's course
Compulsory course	M00000001	The Theory and Practice of Socialism with Chinese Characteristics	1	2	master's course
Compulsory course	M00000131	The First foreign language (Master English)	1	2	master's course
Compulsory course	M07030001	Advanced chemical experiment	2	3	master's course
Compulsory course	M07030002	Modern instrument analysis method	2	3	master's course
Compulsory course	M07030004	Elementary quantum chemistry	1	3	master's course
Elective course	M00000002	Dialectics of Nature	2	1	master's course
Elective course	M07030105	Nano science and technology	2	3	master's course
Elective course	M07030403	Introduction to catalytic chemistry	1	3	master's course
Elective course	M0703Z101	Green chemistry and technology	1	3	master's course
Elective course	M0703Z102	Carbohydrate Chemistry	2	3	master's course
Elective course	M07101003	Life cycle impact analysis	1	3	master's course
Elective course	M07101005	Renewable energy technology	2	3	master's course
Elective course	M07101006	Bio-economy, energy market and green market	2	3	master's course
Elective course	M07100104	Plant Developmental Biology	1	3	master's course
Elective course	M07100105	Biological resources and natural product chemistry	1	3	master's course
Elective course	M08170310	Biomass Energy: Technology and Application	2	3	master's course

Total credits: 48 Tutor review: Date:

Sichuan University Graduate Individual Training Program

Grade：2019 Student ID：2019222040128 Name：Qinsiying Tutor：

College: College of Life Sciences Discipline ID：071000 Professional Name: 071000 Biology

Course category	Course number	Course Title	semester	credit	Course level
Compulsory course	G00000301	Academic Exchange Activities	1	2	master's course
Compulsory course	G00000302	Postgraduate Comprehensive Quality Series	1	1	master's course
Compulsory course	G00000305	Academic norms and postgraduate writing guide	1	1	master's course
Compulsory course	M00000001	The Theory and Practice of Socialism with Chinese Characteristics	1	2	master's course
Compulsory course	M00000131	The First Foreign Language	1	2	master's course
Compulsory course	M07100001	Microcosmic Biology	1	4	master's course
Compulsory course	M07100003	Biostatistics and data analysis	1	4	master's course
Elective course	M00000002	Dialectics of Nature	2	1	master's course
Elective course	M0703Z102	Chemistry of carbohydrates	1	3	master's course
Elective course	M07100101	In-depth analysis of literature, experimental design and skills training	2	3	master's course
Elective course	M07100102	Advanced plant physiology	1	3	master's course
Elective course	M07100104	Plant developmental biology	1	3	master's course
Elective course	M07100105	Biological resources and natural product chemistry	1	3	master's course
Elective course	M07101003	Policy (Life cycle analysis)	1	3	master's course
Elective course	M07101005	Renewable energy technology	2	3	master's course
Elective course	M07101006	Bio-economy, energy market and green market	2	3	master's course
Elective course	M0710Z102	Computing biology	1	3	master's course
Elective course	M08170310	Biomass Energy: Technology and Application	2	3	master's course

Total credits: 47 Tutor review: Date:

Sichuan University Graduate Individual Training Program

Grade：2019 Student ID：2019226220001 Name：SuRanran Tutor：

College: New Energy and Low Carbon Technology Research Institute Discipline ID：0710Z9

Professional Name: 0710Z9 Biomass energy

Course category	Course number	Course Title	semester	credit	Course level
Compulsory course	G00000301	Academic Exchange Activities	1	2	master's course
Compulsory course	G00000302	Postgraduate Comprehensive Quality Series	1	1	master's course
Compulsory course	G00000305	Academic norms and postgraduate writing guide	1	1	master's course
Compulsory course	M00000001	The Theory and Practice of Socialism with Chinese Characteristics	1	2	master's course
Compulsory course	M00000131	The First Foreign Language	1	2	master's course
Compulsory course	M07100001	Microcosmic Biology	1	4	master's course
Compulsory course	M07100003	Biostatistics and data analysis	1	4	master's course
Elective course	M00000002	Dialectics of Nature	2	1	master's course
Elective course	M0703Z102	Chemistry of carbohydrates	1	3	master's course
Elective course	M07100101	In-depth analysis of literature, experimental design and skills training	2	3	master's course
Elective course	M07100104	Plant development biology	1	3	master's course
Elective course	M07100105	Biological resources and natural product chemistry	1	3	master's course
Elective course	M07101003	(policy) Life cycle analysis	1	3	master's course
Elective course	M07101005	Renewable energy technologies	2	3	master's course
Elective course	M07101006	Bioeconomy, energy market and green market	2	3	master's course
Elective course	M08170310	Biomass Energy: Technology and Application	2	3	master's course

Total credits: 41 Tutor review: Date:

Sichuan University Graduate Individual Training Program

Grade：2019 Student ID：2019223075176 Name：Liu Zhang Tutor：Houfang Lu

College: College of Chemical Engineering Discipline ID：085216 Professional Name: Chemical Engneering

Course category	Course number	Course Title	semester	credit	Course level
Compulsory course	G00000301	Academic exchange activities	1	2	master's course
Compulsory course	G00000302	Graduate Comprehensive Quality Series	1	1	master's course
Compulsory course	G00000304	Engineering ethics	1	1	master's course
Compulsory course	G00000305	Academic norms and postgraduate thesis writing guidance	1	1	master's course
Compulsory course	M00000001	Research on the Theory and Practice of Socialism with Chinese Characteristics	1	2	master's course
Compulsory course	M00000131	First foreign language (Master English)	1	2	master's course
Compulsory course	M00000202	Method of Mathmatical Physics	1	3	master's course
Compulsory course	M00000203	Mathematical analysis	1	3	master's course
Compulsory course	M00000602	Engineering practice	1	2	master's course
Compulsory course	M08170001	Chemical transfer phenomenon	2	3	master's course
Compulsory course	M08170002	Chemical Thermodynamics	2	3	master's course
Elective course	M00000002	Dialectics of Nature	2	1	master's course
Elective course	M03070401	Specialized English	2	2	master's course
Elective course	M0703Z102	Carbohydrate Chemistry	1	3	master's course
Elective course	M07101003	Life Cycle Impact Assessment	1	3	master's course
Elective course	M07101005	Renewable energy technology	2	3	master's course
Elective course	M07101006	Bio-based economy, energy market and green market	2	3	master's course
Elective course	M07100104	Plant Developmental Biology	1	3	master's course
Elective course	M07100105	Biological resources and natural product chemistry	1	3	master's course
Elective course	M08170310	Biomass Energy: Technology and Application	2	3	master's course

Total credits: 47 Tutor review: Date:

Annex III