

1. 基于生源特点制订人才培养方案
- 1.1 人才培养方案及课程体系
- 1.1.1 “1+1+1 三段式”培养方案课程体系图

图 1 石油炼制技术专业“文莱炼化班”(四批次)人才培养方案及课程体系

Teaching Standards

for Petroleum Refining Technology

I. Name of Major (Code of Major)

Petroleum Refining Technology (470202)

II. Admission Requirements

Graduates with diplomas of high schools, secondary vocational schools or the equivalents.

III. Program Duration

Three years.

IV. Careers Oriented

Major Category	Major Classification	Corresponding Industries	Main Vocational Types	Examples of Main Posts (Technical)	Examples of Vocational Qualification Certificates (Vocational technical level)
Biology & Chemical Engineering	Chemical Engineering Technology	C Manufacturing Industry. 25 Petroleum Processing, Coking & Nuclear fuel Processing. 251 Refined oil Product manufacturing. 2511 Crude oil processing & oil product manufacturing.	6-10-01(GBM 61001) Production staff for oil refining. 6-10-99(GBM 61099) Production staff for other oil processing, coking & coal chemical industry. 6-11-02(GBM 61102) Manufacturing staff for basic chemical materials. 6-11-99(GBM 61199) Manufacturing staff for other chemical materials & products.	Production operator, general controller, instrument management and maintenance, equipment management and maintenance, marketing & service, sewage treatment, new product development, safety guard.	General controllers of chemical engineering (intermediate level)

V. Cultivation Objectives

The purpose of the major is to cultivate highly qualified technical talents with full development of good virtue, intelligence, physique, aesthetics and Labour, who can meet the needs of production, construction, and management of petroleum refining with necessary related professional theoretical and practical knowledge and technical capability as well as favourable vocational ethics, dedication and communication ability, who can master the basic and necessary principles and technological processes for manufacturing various fuel oils and petrochemical products with petroleum as materials, able to make the raw material pretreatment, reaction and product separation during the process of the typical oil production, and who can work on international oil refining production, product testing, equipment maintenance and production management.

VI. Cultivation Standard

Graduates from the major are supposed to meet the following requirements in quality, knowledge and competency.

(1) Quality

1. Cultural quality:

(1) Favourable scientific humanities quality, good hobbies, interests and habit of lifelong learning to cultivate themselves;

(2) Correct cognitive concepts and approaches, true and practical work style, self-independence, self-esteem, with right aesthetic appreciation and cross-cultural communicative quality;

(3) Ability to realize the influence of science and related technologies on the social development, natural environment and human lives, as well as recognition of sustainable development to struggle for.

2. Vocational quality:

(1) Professional ethics such as faith, honesty, realistic, innovation and dedication;

(2) Being diligent and eager to learn, loving the profession, hard working, with responsibility, ethics and team spirit;

(3) Acknowledging the petrochemical enterprise culture and working to match it;

(4) Self-cultivated vocational ethics:

Dedication and devotion to duty; proper operation according to the rules to ensure safety; being serious and responsible, honest and trustworthy; solidarity, cooperation and mutual respect; cost saving, consumption reduction to increase efficiency; Excelsior and meticulousness; Abiding by regulations and attaching importance to safety; hard-working, passionate entrepreneurship; environment protect and civilized production.

3. Psychological quality:

Possessing qualified physical and psychological quality, adhering to sports exercises and healthy recreations to strengthen the mind and bodies to reach the students physique and health standards; awareness of safety and environmental protection.

(II) Knowledge

The core knowledge of the major is the basic oil refining knowledge and its production operation:

1. Comprehension of the specifications, models, structures and applications of the electrical instruments, computers, and measuring instruments used in the refining production equipment;

2. Comprehension of the names, specifications, models, structures property, material, spare parts and components of all the tools and devices used in the refining production equipment, as well as the related basic knowledge of maintenance, safe application and corrosion prevention;

3. Comprehension of the records of operation , shifts, maintenance and others of the refining production equipment;

4. Mastery of basic professional knowledge related with the oil refining technology, such as inorganic chemistry, organic chemistry, analytical chemistry, chemical process and principles;

5. Mastery of fundamental principles and related calculation about the fluid transportation, heat transmission, rectification, extraction, and absorption;

6. Mastery of the chemical composition and physicochemical property of petroleum and oils, usability of the main refining products such as gasoline, jet fuel, diesel and lubricant, as well as the relationship among the physical property, usability and chemical composition of petroleum and its products;

7. Mastery of the composition and property of the raw materials used and its products in the typical oil-refining equipment processes such as crude distillation, catalytic cracking, catalytic reforming,

catalytic hydrogenation, oil rectification and blending.

(III) Competency

1. Professional competency

(1) Mastery of the fundamental principles and approaches of crude oil and its products' blending, and proper operation of the blending equipment;

(2) Mastery of the application method of the analytical and detective equipment for the oil and its products, and the data treatment;

(3) ability to conduct the simple calculation of the material balance, energy balance, and pressure balance as well as simple economical calculation during the typical oil-refining equipment processes;

(4) Ability to make overall safety inspection to the production, to raise and conduct safety measures for the purpose of production safety; to conduct correct judgement on and proper treatment for common accidents; to understand and execute the accident handling pre-plans and emergency cut-off program;

(5) Ability to detect and handle various potential accidents during production, correctly to analyze, judge and handle abnormal phenomena and severe accidents;

(6) Ability to conduct the start-up, shut-down and proper operation of the typical oil-refining equipment ;

(7) Mastery of the usage and operation points of the main equipment, technical parameter and control instruments (software) during the typical oil-refining equipment processes.

2. Competency for approaches

- (1) Ability to read and comprehend related technical reports, management documents, and the technological process diagrams and equipment diagrams;
- (2) Ability of digital applications;
- (3) Ability of information acquisition, process and treatment;
- (4) Learning capacity for new knowledge and technology.

VII. Curriculum Setting and Teaching Period Arrangement

1. Curriculum setting

Public basic courses and professional courses are mainly included in this major.

(1) Public basic courses consist of *IT, sports, vocational guidance, public security, innovation and entrepreneurship education, vocational quality education, and Chinese excellent traditional culture*. Special lectures (activities) on *energy conservation and emission reduction, green environmental protection, management knowledge, labor health*, etc. shall also be held.

(2) Professional courses include professional basic courses, professional core courses and professional development courses, and relevant practical teaching links are covered. Examples are listed as below.

Professional basic courses: *basic chemistry, chemical engineering drawing*, etc.

Professional core courses: *chemical unit process and equipment, introduction to petroleum and products, fuel oil production technology*, etc.

Professional development courses: *cultural history of petroleum and*

chemical industry, petrochemical production technology, chemical safety technology, etc.

(3) Professional core courses and their main teaching contents.

A. *Organic Chemistry*: Guiding ss. to learn the structure, classification, nomenclature, preparation, properties and uses of fatty hydrocarbons, aromatic hydrocarbons, halogen-containing compounds, oxygen-containing compounds, important nitrogen-containing compounds and their derivatives; to get familiar with the industrial sources, synthetic methods, properties and uses of important organic compounds.

B. *Chemical unit process and equipment*: Leading ss. to learn the basic principle, characteristics, industrial structure and size of equipment, basic concepts and calculation methods of unit process; to master the basic principle of typical unit operation; to understand the structure, working principle, correct operation method and common fault treatment of common main equipment in chemical plant; to determine reasonable process structure conditions according to production conditions, to understand the impact of parameter changes on production process; to correctly select pumps, heat exchangers and towers, and determine the main process structure dimensions.

C. *Fuel oil production technology*: It mainly involves the main production processes of gasoline, aviation kerosene and diesel oil with crude oil as raw material, and the physical and chemical properties, process principle, process flow, operation factor analysis, process control methods, main post operations of raw materials and products in typical fuel oil processing processes such as crude oil distillation, catalytic cracking, catalytic reforming, catalytic hydrogenation, fuel oil refining

and blending main equipment structure and characteristics.

D. *Introduction to petroleum and products*: Helping ss. to learn the classification of petroleum products, the use process and methods of main oil products such as gasoline, aviation coal, diesel and lubricating oil, as well as the chemical composition and physical properties of oil products; to master the relationship between service performance and chemical composition of main petroleum products.

(4) Practical teaching links mainly include cognitive practice, productive training, basic chemistry experiment, on-the-job practice, innovation and entrepreneurship education, etc.

2. Teaching period arrangement

The total class hours are generally 2000-2200 periods. Among them, the total periods of public basic courses are generally not less than 15% of the total class hours, and the cumulative class hours of various elective courses are not less than 10% of the total class hours.

In principle, the class hours of practical teaching shall not be less than 50% of the total class hours. Among them, the cumulative time of on-the-job practice is 6 months in principle, about 440 periods, and the internship time can be arranged according to the actual concentration or stages.

VIII. Basic Teaching Conditions

1. Teaching staff

There should be a teaching team with sufficient number of full-time and part-time bilingual teachers. Generally, full-time teachers are equipped according to the standard that the proportion of students to full-time teachers is no more than 25:1. The proportion of dual qualified

teachers in professional course teachers should generally not be less than 80%. There shall be at least one professional leader, who shall have a senior professional title in principle. The number of professional full-time teachers set up for the first time shall not be less than 3, and the number of full-time teachers with relevant majors shall be more than 3, including no less than 2 teachers with senior titles. Enough basic course teachers (mathematics, computer, physical education, etc.) should be provided.

Full time teachers should be qualified as teachers of colleges and universities, preferably have more than two years of enterprise experience; have professional knowledge and professional practice ability in the field of petroleum refining and production technology, and have good professional English teaching ability.

The number of part-time teachers shall not be less than the number of full-time teachers. In principle, they shall have more than 5 years of front-line work experience in petroleum refining enterprises; have intermediate and above professional titles, be able to solve technical problems in the production process, be good at communication and expression; have certain English Teaching ability and be able to undertake teaching tasks.

2. Teaching facilities

It chiefly includes professional classrooms, on campus and off campus training bases, post practice bases, etc.

(1) The basic conditions that professional classrooms should meet: the classroom should be equipped with network interface and multimedia teaching equipment, and the network should have sufficient bandwidth.

(2) The basic requirements that in-campus training room (base)

should meet: it should provide students with a highly simulated or simulated enterprise working environment and place, and the equipment layout, safety and environmental protection on the training site should meet the requirements of relevant national regulations and vocational skill appraisal.

(3) Basic requirements for off-campus training base: the types of enterprises to be selected are petroleum refining enterprises, petrochemical production enterprises, organic chemical production enterprises, polymer production enterprises, etc. At the same time, professional teachers can also go to the off campus training base for off-site practice and appropriately participate in enterprise technological transformation and new technology development.

(4) The basic requirements that the practice base should meet: the number should meet the requirements of students' on-the-job practice for more than half a year, and tripartite cooperation supervision and evaluation mechanism of students' on-the-job practice should be established.

(5) Basic requirements for supporting information-based teaching: a convenient and fast campus network with access to CERNET and CHINANET Internet.

3. Teaching resources

It mainly includes bilingual teaching materials, books and digital resources that can meet the needs of students' professional learning, and teachers' professional English teaching research and teaching implementation.

(1) Basic requirements for textbook selection: the school shall establish a bilingual textbook selection system and encourage cooperation

with industry enterprises to develop bilingual school-based textbooks for professional courses with distinctive characteristics.

(2) Basic requirements for allocation of digital resources: it is suggested to link network high-quality bilingual teaching resources such as MOOC National Excellent Course online platform of China University and national teaching resource database of Applied Chemical Technology Specialty, so as to meet the needs of students' independent online learning and lay a solid foundation for students' sustainable development after graduation.

IX. Quality Assurance

1. To establish professional construction and teaching process quality monitoring mechanism, put forward clear quality requirements and standards for each main teaching link, so that talent training specifications through teaching implementation, process monitoring, quality evaluation and continuous improvement are achieved.

In the daily teaching management, to form the teaching inspection system, teaching quality analysis system, teaching information feedback system and the five evaluation system of "students' evaluation of teaching, teachers' evaluation of learning, peers' evaluation of lessons, experts' evaluation of quality and social evaluation of students".

A two-level teaching quality monitoring and evaluation system with the participation of enterprises shall be established. According to the situation of on-the-job practice, the post practice management and assessment system should be formulated and implemented with enterprise leaders and instructors, and strengthen the management of talent training process; In order to ensure the quality of post practice, post practice

management system, assessment system and part-time teacher management system should be formulated to improve the quality assurance system of both schools and enterprises.

2. To improve the teaching management mechanism, strengthen the operation and management of daily teaching organization, establish and improve the class patrol and listening system, and strictly enforce the teaching discipline and classroom discipline.

To establish a system of joint management between schools and enterprises suitable for the combination of work and study, and form an institutionalized, standardized and operable management method of joint management between schools and enterprises. In the process of implementing talent training plan and teaching management, flexible management is implemented for talent training according to the requirements of enterprises and students.

3. To establish a tracking and feedback mechanism and social evaluation mechanism for graduates, thus regularly evaluating the quality of talent training and the achievement of training objectives.

4. Making full use of the evaluation and analysis results to effectively improve professional teaching, strengthen professional construction, and continuously improve the quality of talent training.

(1) To establish a comprehensive examination and assessment system for ability, knowledge and quality.

(2) In terms of the selection of examination methods, diversified examination methods shall be adopted according to the characteristics of the examination subjects, including written examination, oral examination, homework, skill operation, project design and production, focusing on the assessment of students' thinking methods and ability to

solve practical problems.

(3) The assessment of examination results adopts the combination of results and process, with particular attention to process assessment.

(4) To bring the examination contents of vocational qualification certificate into the teaching process of relevant courses, so as to improve students' vocational core competence and enhance their employment competitiveness.

(5) Experts from industrial enterprises and relevant social sectors are invited to participate in the assessment and evaluation of practice oriented and work study combined courses.

A school enterprise cooperation professional construction committee composed of the dean of the secondary college as the principal, Vice Dean of teaching, professional leaders, backbone teachers, enterprise leaders and experts is established to guide the professional construction, to formulate and review the teaching system, to monitor the teaching process and evaluate the quality of talent training.

2019年石油炼制技术专业“文莱炼化班”人才培养方案课程体系

年级:2019

专业: 石油炼制技术专业“文莱炼化班”

培养层次: 专科

序号	课程类别 Course Category	课程名称 Course Title	总学时	学时构成		周学时分布		考核方式	说明
				讲	实	32 (11)	1		
1	专业知识类课程	无机化学Inorganic Chemistry	20	20		4			上5周/强化
2	专业知识类课程	分析化学Analytical Chemistry	20	20		4			上5周/强化
3	专业知识类课程	有机化学Organic Chemistry	30	30		6			上5周/强化
4	专业知识类课程	物理化学Physical Chemistry	20	20		4			上5周/强化
5	专业知识类课程	化工单元过程及设备I与II Chemical Unit Process and Equipment I&2	90	90		10			
6	专业知识类课程	石油及产品概论Introduction to Oil & Product	40	40		4			上10周
7	专业知识类课程	化工设备基础Chemical Equipment Foundation	40	40		4			上10周
8	专业知识类课程	燃料油生产技术Fuel Oil Production Technology	70	70		7			
小计一			330	330					
1	岗位能力类课程	无机化学实验技术Inorganic Chemistry Experimental Technique	25		25		1周		
2	岗位能力类课程	有机化学实验技术Organic Chemistry Experimental Technique	25		25		1周		
3	岗位能力类课程	物理化学实验技术Physical Chemistry Experimental Technique	25		25		1周		
4	岗位能力类课程	分析化学实验技术Analytical Chemistry Experimental Technique	25		25		1周		
5	岗位能力类课程	化工单元操作实训Chemical Unit Operation Training	50		50		2周		
6	岗位能力类课程	化工单元仿真实训Chemical Unit Simulation Training	25		25		1周		
7	岗位能力类课程	油品分析实训Oil Analysis and Training	50		50		2周		
8	岗位能力类课程	化工安全实训 Chemical Safety Training	25		25		1周		
9	岗位能力类课程	常减压装置仿真实训Atmospheric and Vacuum Distillation Unit Simulation Training	25		25		1周		
10	岗位能力类课程	催化裂化仿真实训Fluid Catalytic Cracking (FCC) Simulation Training	50		50		2周		
11	岗位能力类课程	催化重整仿真实训Catalytic Reforming Simulation Training	50		50		2周		
12	岗位能力类课程	柴油加氢装置仿真实训Diesel Hydrogenation Device Simulation Training	25		25		1周		
13	岗位能力类课程	炼油工艺装置实训Refining Process Equipment Training	25		25		1周		
14	岗位能力类课程	原油常压蒸馏装置实训Crude Oil Distillation Unit Training	25		25		1周		
15	岗位能力类课程	DCS反应精馏与中试装置实训DCS Reactor Distillation and Pilot Plant Training	25		25		1周		
16	岗位能力类课程	柴油加氢实物仿真实训Diesel Hydrogen Physical Simulation Training	25		25		1周		
17	岗位能力类课程	小型提升管催化裂化装置实训Small Riser Catalytic Cracking Unit Training	25		25		1周		
小计二			525		525		21周		
总计				855			1周 (week)		
总学时数: 855 理论与实践课程比例: 525: 330=1.6									
修订人: 顾林, 杨兴错					审核人: 李薇				

2022年石油炼制技术专业“文莱炼化班”人才培养方案课程体系

年级:2019 (第二批)
2020 (第三批)
2021 (第四批)

专业: 石油炼制技术专业“文莱炼化班”

培养层次: 专科

序号	课程类别 Course Category	课程名称 Course Title	学 分	总 学 时	学时构成		周学时分布		考核方式	说 明
					讲	实	32 (11)	1		
1	专业知识类课程	无机化学Inorganic Chemistry	1	20	20		4		考试	上5周/强化
2	专业知识类课程	分析化学Analytical Chemistry	1	20	20		4		考试	上5周/强化
3	专业知识类课程	有机化学Organic Chemistry	6.5	110	110		6		考试	上5周/强化
4	专业知识类课程	物理化学Physical Chemistry	3	60	60		4		考试	上5周/强化
5	专业知识类课程	化工单元过程及设备I与II Chemical Unit Process and Equipment I&2	5.5	100	100		10		考试	
6	专业知识类课程	石油及产品概论Introduction to Oil & Product	3.5	60	60		4		考试	上10周
7	专业知识类课程	工业仪表自动化Industrial Instrumentation Automation	2.5	40	40		4		考试	上10周
8	专业知识类课程	燃料油生产技术Fuel Oil Production Technology	4	70	70		7		考试	
小计一			27	480	480					
1	岗位能力类课程	无机化学实验技术Inorganic Chemistry Experimental Unit Simulation Training	2	25		25		1周	考试	
2	岗位能力类课程	有机化学实验技术Organic Chemistry Experimental Unit Simulation Training	2	25		25		1周	考试	
3	岗位能力类课程	物理化学实验技术Physical Chemistry Experimental Unit Simulation Training	2	25		25		1周	考试	
4	岗位能力类课程	分析化学实验技术Analytical Chemistry Experimental Unit Simulation Training	2	25		25		1周	考试	
5	岗位能力类课程	化工单元3D仿真实训Chemical Unit 3D Simulation Training	8	100		100		4周	考试	
6	岗位能力类课程	大型分析仪器仿真实训Large-sized Analytical Instruments Training	4	50		50		2周	考试	
7	岗位能力类课程	化工安全仿真实训 Chemical Safety Simulation Training	2	25		25		1周	考试	
8	岗位能力类课程	常减压装置3D仿真实训Atmospheric and Vacuum Distillation Unit 3D Simulation Training	4	50		50		2周	考试	
9	岗位能力类课程	催化裂化3D仿真实训Fluid Catalytic Cracking (FCC) 3D Simulation Training	6	75		75		3周	考试	
10	岗位能力类课程	催化重整3D仿真实训Catalytic Reforming 3D Simulation Training	4	50		50		2周	考试	
11	岗位能力类课程	柴油加氢装置3D仿真实训Diesel Hydrogenation Device 3D Simulation Training	3	75		75		3周	考试	
12	岗位能力类课程	芳烃抽提装置仿真实训Aromatics Extraction Unit 3D Simulation Training	4	50		50		2周	考试	
13	岗位能力类课程	乙烯裂解装置3D仿真实训ethylene cracking unit 3D simulation training	4	50		50		2周	考试	
14	岗位能力类课程	化工设备基础Chemical Equipment Foundation	4	50		50		2周	考试	理实一体化
小计二			51	625		625		27周		
总计			83	1105				27周 (week)		
总学时数: 1105 实践与理论课程比例: 650: 480=1.4										
修订人: 顾林, 孟石					审核人: 李薇					

1.1.2 “2.0+0.5+0.5三段式”培养方案课程体系

图2 2020年文莱炼化班人才培养方案课程体系

Curriculum system of Petrochemical technology professional personnel training program															
Year Grade: 2020 专业 Major: 石化工艺技术 Petrochemical Technology 培养层次 Culture Level: 专科 College Degree															
序号 Serial number	课程类别 Course Category	课程名称 Course Title	学分 Credits	学时 Hours	学时构成 School Time Distribution			周学时分布 Weekly Time Distribution						考核方式 Assessment methods (含过程性考核) (含过程性考核)	
					讲授 Lecturing	实训 Training	上机 Computer Training	第一年 First year		第二年 Second year		第三年 Third year			
					1	2	3	4	5	6	7	8	9	10	
1	职业素质类课程	公共安全Public Safety	2.5	36	36										
2	职业素质类课程	基础化学Basic Chemistry	3.5	57	57										
3	职业素质类课程	物理 Physics	3.5	57	57										
4	职业素质类课程	体育与健康1(必修 Physical Education and Health 1&2)	7.5	152		152									
5	职业素质类课程	数学应用与实训Applications and Practice of Mathematics	4.5	76	76										
6	职业素质类课程	电子电工与电气Electrical and Electronic Technology	4.5	76	76										
7	职业素质类课程	英语口语Quality Training	2					2周							
8	职业素质类课程	计算机操作与实训Computer Operation Technology	4	76	76										
9	职业素质类课程	英语English	4	76	76										
10	职业素质类课程	法律Law	4	76	76										
11	职业素质类课程	宗教Religion	4	76	76										
12	职业素质类课程	小计-Subtotal	32	532	504	112	76								
9	专业基础类课程	无机化学Inorganic Chemistry	4	60	60				3周						
10	专业基础类课程	分析化学Analytical Chemistry	4	60	60				4周						
11	专业基础类课程	有机化学Organic Chemistry	7.5	120	120				4周	4周					
12	专业基础类课程	物理化学Physical Chemistry	4	60	60				4周						
13	专业基础类课程	化工单元过程及设备1(必修 Chemical Unit Process and Equipment 1&2)	7.5	120	120				4周	4周					
14	专业基础类课程	化工制图Chemical Drawing	4.5	76	76			76							
16	专业基础类课程	石油产品生产装置实训Introduction to Oil & Product	3	90	90						6周				
17	专业基础类课程	工业仪表自动化Industrial Instrumentation Automation	4	60	60						6周				
18	专业基础类课程	石油化工生产技术 Petrochemical Production Technology	5	90	90						6周				
19	专业基础类课程	小计-Subtotal	45.5	734	660	76	20	24							
19	职业技能类课程	石化专业英语Specialized English for Refining and Chemical Engineering	3	48	48						1周				
20	职业技能类课程	化工软件应用Chemical software and Application	3	48	48			48							
21	职业技能类课程	工业废水处理Introduction to Wastewater Treatment Technology	3	48	48						1周				
22	职业技能类课程	管式加热炉原理及应用Principle and application of tubular heating furnace	3	48	48						1周				
23	职业技能类课程	小计-Subtotal	12	192	144	48					24				
24	岗位能力类课程	有机化学实验B: Organic Chemistry Experimental Technique	4	60	60						2周				
26	岗位能力类课程	分析化学实验B: Analytical Chemistry Experimental Technique	4	60	60						2周				
27	岗位能力类课程	化工单元操作实训Chemical Unit Operation Training	4	60	60						2周				
28	岗位能力类课程	化工单元操作实训Chemical Unit Operation Training	4	60	60						2周				
29	岗位能力类课程	油品分析Oil Analysis and Training	4	60	60						2周				
31	岗位能力类课程	常减压蒸馏装置实训Atmospheric and Vacuum Distillation Unit Simulation Training	4	60	60						2周				
32	岗位能力类课程	石油烃热裂解装置实训Thermal cracking of petroleum hydrocarbon Training	4	60	60						2周				
33	岗位能力类课程	石油烃热裂解装置实训Practical training of Petroleum hydrocarbon Pyrolysis Unit	2	30	30						1周				
34	岗位能力类课程	天然气压缩装置实训Practical training of Propane Gas Compression Unit	2	30	30						1周				
35	岗位能力类课程	天然气分离装置实训Training of Propane Gas Separation Unit	2	30	30						1周				
36	岗位能力类课程	原油减压蒸馏装置实训Crude Oil Distillation Unit Training	2	30	30						1周				
38	岗位能力类课程	化工设备基础Chemical Equipment Foundation	4	60	60						2周				
39	岗位能力类课程	小计-Subtotal	23	300	375						20周				
40	岗位能力类课程	小计-Subtotal	43	1300	1175										
合计 Total			152.5	2660	1308	1377	200								
总学时数 (Total Hours): 2660 实践与理论课程比例 (Proportion of practice and theory courses): 1205: 1108=1.09: 1															
修订人: 焦林定 LinHong Jiao, 苏雪花 XueHua Su 审核人: 李霞 Wei Li, 焦林 Lin Xie															

图3 2020年文莱水环境监测与治理班人才培养方案课程体系

水环境监测与治理专业人才培养方案课程体系															
Year Grade: 2020 专业: 水环境监测与治理 Environmental Monitoring and Treatment 培养层次: 专科 College Degree															
序号 Serial number	课程类别 Course Category	课程名称 Course Title	学分 Credits	学时 Hours	学时构成 School Time Distribution			周学时分布 Weekly Time Distribution						考核方式 Assessment methods (含过程性考核) (含过程性考核)	
					讲授 Lecturing	实训 Training	上机 Computer Training	第一年 First year		第二年 Second year		第三年 Third year			
					1	2	3	4	5	6	7	8	9	10	
1	职业素质类课程	实用汉语会话Practical Chinese Speaking, Writing and Working	8	120	120										
2	职业素质类课程	公共安全Public Safety	3	30	30										
3	职业素质类课程	基础化学Basic Chemistry	3	120	120										
4	职业素质类课程	物理与工程(必修 Physical Education and Health 1&2)	7.5	152		152									
5	职业素质类课程	数学应用与实训Applications and practice of Mathematics	5	75	75										
6	职业素质类课程	计算机操作与实训Computer operation technology	4	60	60			60							
7	职业素质类课程	英语口语Basic English	3	45	45										
8	职业素质类课程	英语English	3	45	45										
9	职业素质类课程	法律Law	4	60	60										
10	职业素质类课程	宗教Religion	4	60	60										
11	职业素质类课程	小计-Subtotal	32	780	780										
12	专业基础类课程	无机分析化学Inorganic and Analytical Chemistry	3	45	45				3周						
13	专业基础类课程	有机化学Organic Chemistry	3	45	45				3周						
14	专业基础类课程	物理化学Physical Chemistry	3	45	45				3周						
15	专业基础类课程	化工单元操作实训Chemical unit operation technology	3	100	100				3周						
16	专业基础类课程	水质检测与保护 Water Resources	3	30	30				3周						
17	专业基础类课程	水处理工程 Water treatment technology	2	45	45				2周						
18	专业基础类课程	水体富营养化 Water eutrophication technology	4	60	60				4周						
19	专业基础类课程	水污染控制技术 Technology of Water Pollution Control	3	75	75				3周						
20	专业基础类课程	工业分析Industrial Analysis	3	75	75				3周						
21	专业基础类课程	化工制图Chemical Drawing	3	45	45				3周						
22	专业基础类课程	工业供水处理技术 Treatment Technology of Industrial Water Supply	3	45	45						3周				
23	专业基础类课程	油品分析 Oil analysis	3	45	45						3周				
24	专业基础类课程	小计-Subtotal	36	565	565										
22	职业技能类课程	危险化学品基础知识 Basic knowledge of hazardous chemicals	2	30	30						2周				
26	职业技能类课程	工业废水处理Introduction to Wastewater Treatment Technology	4	60	60						4周				
27	职业技能类课程	石油化工生产技术 Petrochemical Technology	4	60	60						4周				
29	职业技能类课程	电子电工与电气Electrical and Electronic Technology	3	45	45						3周				
30	职业技能类课程	化工软件应用Chemical software and Application	3	45	45						3周				
31	职业技能类课程	小计-Subtotal	16	240	240										
31	岗位能力类课程	有机化学实验A: Organic Chemistry Experimental Technique	1.5	25	25						1周				
32	岗位能力类课程	分析化学实验A: Analytical Chemistry Experimental Technique	1.5	25	25						1周				
33	岗位能力类课程	水处理微生物学 Water Treatment Microbiology Training	1.5	25	25						1周				
34	岗位能力类课程	水处理单元操作实训 Water Treatment Unit Operation Training	3	30	30						2周				
35	岗位能力类课程	水体富营养化实训 Water eutrophication monitoring Training	4	30	30						2周				
36	岗位能力类课程	水处理工程实训 Water Treatment Technology Training	1.5	25	25						1周				
37	岗位能力类课程	水处理工程实训 Water Treatment Technology Training	1.5	25	25						1周				
38	岗位能力类课程	工业分析实训 Industrial Analysis and Training	1.5	25	25						1周				
39	岗位能力类课程	水质检测实训 Water Quality Analysis and Training	1.5	25	25						1周				
40	岗位能力类课程	工业分析实训 Industrial Analysis and Training	1.5	25	25						1周				
41	岗位能力类课程	工业分析实训 Industrial Analysis and Training	1.5	25	25						1周				
42	岗位能力类课程	常减压蒸馏装置实训 Atmospheric and Vacuum Distillation Unit Simulation Training	1.5	25	25						1周				
43	岗位能力类课程	化工单元操作实训 Chemical Unit Operation Training	1.5	30	30						1周				
45	岗位能力类课程	分析化学实训 Analytical Chemistry Training	1.5	25	25						1周				
46	岗位能力类课程	原油减压蒸馏装置实训 Crude Oil Distillation Unit Training	1	30	30						1周				
47	岗位能力类课程	油品分析实训 Oil Analysis Practice	3	30	30						3周				
小计-Subtotal			30	500	500										
The small amount of Professional training courses			60	1000	1000										
总计 Total			164	2565	1380	1185	52								
总学时数 (Total Hours): 2560 实践与理论课程比例 (Proportion of practice and theory courses): 1145: 1135=1.01															
修订人: 李霞芳 审核人: 李霞, 焦林															

- 动因素的分析与判断能力。
- 具备典型化工生产设备基本性能参数的测试、验收与评价能力。
 - 具备石油化工新技术应用与技术改造的基本能力。
 - 树立终身学习和不断创新意识,具有结合专业开展自我提升的能力。
 - 具备环境保护基本知识,树立清洁生产 and 环境保护意识。

(四) 职业拓展要求

- 学习化工生产水处理相关知识,熟悉工业水处理过程相关操作。
- 学习油库工艺与设备相关知识,熟悉油库运行、管理相关操作。
- 学习化工安全知识与技能,不断强化安全事故判断与处理能力。
- 学习危险化学品相关知识,熟悉危险化学品生产、储存、运输的安全管理与注意事项。
- 学习仪器分析的相关知识,熟悉仪器分析实训中光谱、色谱与电化学的相关操作。
- 学习工业仪表自动化的相关知识,熟悉工业 DCS 控制系统的应用。
- 学习油品相关知识,熟悉石油及其产品的基本性能及检测方法。

(五) 职业资格证书与等级证书要求

- 与企业岗位资格认定相结合,取得生产装置操作相关职业资格证书。
- 取得全国计算机等级考试合格证书。
- 取得英语交际应用能力相关证书。

(六) 毕业学分要求

依据本专业综合职业能力要求,并参照教育部高职高专学分管理的有关规定,本专业毕业学分须达到以下要求:

本专业毕业总学分必须达到 151 分以上,其中,专业骨干课程学分必须达到所占比例的 90%,达不到者,不得毕业。

六、课程体系设计

行典型工作任务分析



C)针对岗位能力确定课程

课程分类	课程名称及类型	教学方式
职业素养类课程	思想道德修养与法律基础	理论教学
	毛泽东思想和中国特色社会主义理论体系概论 II	理论教学
	数学应用与实践	理论教学
	高等英语进阶英语 I 及 II 课程	听说读写相结合教学
	体育与健康 II	课内实践教学
	计算机操作技术	理实一体化教学
	大学生心理健康教育	尔雅通识课
	中华优秀传统文化类课程	尔雅通识课
	创新创业类课程	尔雅通识课
	入学教育及军训	校内实践
	公益劳动	校内实践
	大学生国防教育	理论结合实践教学
	专业知识类课程	无机化学
化工制图(少)		理论教学
分析化学		理论教学
有机化学(多)		理论教学
石化原料生产技术		理论教学
化工原理 I		理论教学
化工设备基础(多)		理论教学
工业仪表自动化		理论教学
化工反应原理及设备(少)		理论教学
化工原理 II		理论教学
管式加热炉原理及其应用(少)		理论教学
石油化工生产技术(多)		理论教学
石油及产品概论		理论教学
化工安全技术(多)		理论教学
化工专业英语	理论教学	
危险化学品安全	理论教学	

课程类别	课程名称	教学方式
岗位能力类课程	油库工艺与设备	理论教学
	无机化学实验技术	校内实验教学
	有机化学实验技术	校内实验教学
	化学分析实训	校内实验教学
	CAD 实训(少)	软件操作实训
	化工单元仿真实训 I	仿真操作实训
	化工单元仿真实训 II	仿真操作实训
	化工单元操作实训(多)	装置操作实训
	化工检修钳工实训	理实一体化教学
	石化厂认识实习	现场参观实习
	油品分析实训(少)	理实一体化教学
	催化重整仿真实训	仿真操作实训
	原油常压蒸馏装置实训	生产性实训
	化工安全实训	装置实训
	油库生产实训	装置实训
	常减压装置仿真实训	仿真操作实训
	跟岗训教类课程	常减压装置生产技术
加氢精制装置生产技术		跟岗训教
芳烃联合装置生产技术		跟岗训教
柴油加氢装置生产技术		跟岗训教
延迟焦化装置生产技术		跟岗训教
航煤加氢装置生产技术		跟岗训教
公用工程		跟岗训教

七、专业核心课程和主要实训课程简介

(一)专业核心课程简介

序号	课程名称	课程内容	培养能力	建设学时(学分)
1	有机化学(多)	烃、环烃、醇、醛、酮、羧酸、含氮有机化合物等命名、物理化学性质	使学生能够掌握各种有机物的命名、物理与化学性质,培养合成与分析的能力。	78 学时 4.0 学分

2	石油及产品概述(多)	主要介绍原油的组成、性质、分类及评价,汽油、柴油、煤油、润滑油等主要产品组成、性质、使用要求及规格,分析检测方法及标准等方面内容。	使学生能够掌握石油及其主要产品的组成、性质、使用要求、规格参数、分析检测方法及标准等方面知识。	66学时 3.5学分
3	石化原料生产技术	主要介绍原油加工生产石油化工基础原料的原理、工艺流程、典型设备等知识。	掌握石油化工企业典型装置常减压、催化裂化、催化重整、延迟焦化等的加工原理、工艺流程等基本知识,帮助学生分析实际生产工艺条件和处理异常现象的能力。	44学时 3.0学分
4	石油化工生产技术	主要介绍石油化工基本产品的生产原理、工艺流程、典型设备等知识。	掌握基本有机化工原料醇、芳烃等的生产原理、工艺流程等基本知识,帮助学生分析实际生产工艺条件和处理异常现象的能力。	66学时 3.5学分
5	化工原理I	主要介绍流体流动基本原理、流体输送机械、传热及换热器、非均相混合物的分离等模块基本理论知识。	学生能够掌握流体输送单元和换热器单元的基本原理、设备结构、基本计算和设备选型方法,熟悉各单元过程操作方法和调节原理,培养学生分析和解决工程问题的能力。	66学时 5.0学分
6	化工原理II	主要介绍蒸馏、吸收、萃取三个模块基本理论知识。	学生能够掌握化工生产各单元操作的基本原理、设备结构、基本计算和设备选型方法,熟悉各单元过程操作方法,理解各个工艺参数调节原理,了解异常现象的判断及处理方法。	66学时 5.0学分

7

7	油库工艺与设备	主要讲授油库基本工艺和设备工作原理、油库平面布置、管路计算基础;油库储罐、管道、阀门及其他设备的工作原理、结构、使用和维护知识。	使学生熟悉油库工艺和设备操作的一般常识,熟悉高低油品泵机的原理及相关措施。	24学时 2.0学分
8	化工安全与技术	主要学习化工危险物质的分类标准、化工企业防火防爆基本知识和方法等内容。	使学生掌握化工行业各类危险物质的控制及防火防爆基本知识和方法,树立安全生产意识。	44学时 2.5学分

(二)主要实训课程简介

序号	实训名称	课程主要内容	培养能力	建议学时(学分)
1	油品分析实训(少)	主要学习石油化原料和产品质量标准,理化指标检测原理和方法,检测影响因素,试验数据处理和报告,实验安全及相关知识。	学生掌握石油产品分析的相关操作技术,熟悉油品分析的操作过程及其影响因素,强化对油品分析质量控制意识,具备油品质量判断能力。	25学时 2.0学分
2	原油常压蒸馏装置实训	原油常压蒸馏过程原理、设备基本理论学习,装置开车、停车、事故处理操作训练。	通过原油常压蒸馏实训装置,培养原油蒸馏工艺过程理论与实际操作联系能力,实际问题分析和解决能力。	25学时 2.0学分
3	原油常减压装置仿真实训	原油常减压蒸馏工艺原理、设备基本理论学习,装置开车、停车、事故处理操作训练。	培养原油常减压生产工艺过程理论与实际操作能力,常见事故处理的操作能力。	25学时 2.0学分
4	柴油加氢实训	柴油加氢装置工艺流程、设备基本理论学习,装置开车、停车、事故处理操作训练。	通过实物仿真装置操作训练,掌握柴油加氢工艺流程、设备操作技能,典型事故处理方法。	25学时 2.0学分
5	催化重整装置仿真实训	催化重整工艺流程、设备基本理论学习,装置开车、停车、事故处理操作训练。	培养重整生产工艺过程理论与实际操作能力,常见事故处理的操作能力。	50学时 4.0学分

8

6	油库生产实训	本课程学习油品装卸、原油加热、油品混合、油品脱水等操作原理和操作过程。	使学生熟悉油库内生产设备及生产流程,掌握相关岗位操作。	25学时 1.0学分
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八、课程说明

(一) 职业素质类课程

1. 高职英语(课程代码: 000001)

本课程分4个学期,共210学时,主要内容有:词汇、语法、听力、视听说、写作、口语交际等。旨在培养学生英语交际和语言应用能力,帮助学生在学习英语的基础上,扩大知识面,提高英语学习的综合应用能力。重点是加强听力和口语能力的培养。

其次,开展第二课堂,通过教师的指导与辅导,学生自主学习的方式完成适当的补充材料(课外阅读、英语新闻、英文影视欣赏等)的学习内容,组织学生参加英语大赛、英语角等,营造英语学习气氛,培养学生学习兴趣和提高表达能力。

(二) 专业知识类课程

1. 无机化学(课程代码: 0604901)

本课程52学时,应得学分3.0。课程目标是让学生掌握无机化学的基本知识,物质的状态变化、化学平衡、离子平衡、氧化还原反应、原子结构、化学键与分子结构等,培养学生从化学角度分析问题和解决问题的能力,为学生今后学习有机化学、分析化学、物理化学及其他专业课程和从事专业技术工作打下一定的基础。

2. 化工制图(课程代码: 0106080)

本课程44学时,应得学分2.0。《化工制图(少)》主要学习化工制图的基本知识,化工管线的表示方法,物料的标准表示方法,以及控制点的工艺流程图绘制与识图,使学生掌握化工制图的基本知识,相关典型设备及工艺流程的画法与要求,增强学生化工识图、识图的能力。

3. 分析化学(课程代码: 0605922)

本课程44学时,应得学分3.0。本课程目的是掌握基本化学分析理论,掌握准确度和精密度的概念,应用高内消的关系,掌握酸碱滴定、络合滴定、氧化还原滴定、沉淀滴定的基本原理和影响因素,会正确选择分析方法,选择试验仪器,控制试验条件,处理实验数据,具备一定的化学分析的知识能力。

4. 有机化学(多)(课程代码: 0604908)

本课程78学时,应得学分4.0。《有机化学(多)》主要学习脂肪族、脂环族、芳香族、含氮化合物、含氧化合物、含硫化合物及其衍生物的分类、命名、结构、性质、制备方法及用途,掌握石油化工生产中原料、中间体及产品的工业来源、合成方法、性质与用途,为专业课程学习奠定基础。

5. 石化原料生产技术(课程代码: 0602908)

本课程48学时,应得学分3.0。《石化原料生产技术》是石油化工技术专业开设的理论核心课程之一,本课程主要内容有:原油分类评价及加工方向,原油常减压蒸馏、催

9

化、催化重整、延迟焦化等模块,通过本课程学习,学生能够掌握石油产品的各种指标,掌握石油化工企业典型装置的加工原理、工艺流程、设备性能等核心内容。

6. 化工原理I(课程代码: 2603919)

本课程60学时,应得学分3.0。《化工原理I》的主要内容包括:流体流动基本理论、流体输送机械、传热及换热器、非均相混合物的分离等模块,通过本课程的学习,学生能够掌握流体输送单元和换热器单元的基本原理、设备结构、基本计算和设备选型方法,熟悉各单元过程操作方法和调节原理,培养学生分析和解决工程问题的能力,并使学生逐步树立安全意识、技术可行性、经济合理性、生产安全性的工程观念。

7. 化工设备基础(多)(课程代码: 0104912)

本课程72学时,应得学分3.0。《化工7设备基础(多)》是为化工类专业开设的一门综合性机械类课程,是化工专业的专业知识。本课程的教学目的是通过理论教学,使学生获得化工基本设备的基础知识,了解化工压力容器设备的基本知识,了解化工设备材料、标准零件的相关标准,掌握化工厂常用的典型设备,如塔设备、换热器、搅拌反应釜等的基本类型及结构,为今后的工作打好基础。

8. 工业仪表自动化(课程代码: 0604908)

本课程44学时,应得学分3.0。《工业仪表自动化》主要学习温度、压力、液位、流量仪表、调节阀、化工过程自动控制的基本原理与方法,了解常用化工仪表的工作原理及自动化系统的组成和调节原理,掌握基本操作技能,通过理论学习,使学生了解DCS集散控制理论,掌握常用仪表的工作原理。

9. 化工反应原理及设备(少)(课程代码: 2605904)

本课程44学时,应得学分3.0。《化工反应原理及设备(少)》的主要内容包括:化工反应动力学知识、釜式反应器、管式反应器、固定床反应器、催化床反应器、气液相反应器等七个模块,通过本课程学习,学生能够了解各类反应器的结构,掌握各类反应器的校核计算与选型、日常维护、操作规范、异常现象的判断及处理。

10. 化工原理II(课程代码: 2605920)

本课程66学时,应得学分3.0。《化工原理II》主要内容包括:蒸馏、吸收、萃取三个模块,通过本课程的学习,学生能够掌握化工生产各单元操作的基本原理、设备结构、基本计算和设备选型方法,熟悉各单元过程操作方法和调节原理,了解异常现象的判断及处理方法。

11. 管式加热炉原理及应用(少)(课程代码: 2603902)

本课程24学时,应得学分1.5。《管式加热炉原理及应用(少)》的主要内容包括:加热炉的分类、结构、工作原理、辐射室及对室室的计算以及管式加热炉的控制使用与维护,通过学习,使学生掌握管式加热炉的基本结构、工作原理,了解主要部分的基本计算,掌握加热炉控制与维护的基本操作。

12. 石油化工业生产技术(多)(课程代码: 0602912)

本课程48学时,应得学分3.0。《石油化工业生产技术(多)》是石油化工技术专业开设的理论核心课程之一,主要内容有:石油地质勘探、裂解气的分离、乙烯的生产、石油芳烃的生产等模块,使学生能够掌握基本有机化工原料及其衍生物的性质和用途、生产方法的选

10

种、生产原理、操作条件的确定等核心内容。本课程以“化工总控工”等国家职业标准为依据,先施岗位知识、技能点,整合配置理论教学内容,使学生掌握对实际生产工艺条件、异常现象进行分析处理,具备良好的岗位控制和操作能力。

13.石油及产品概述(少)(课程代码: 0009961)

本课程 66 学时, 3.5 学分, 使学生了解石油元素、化合物、混合物等组成, 主要物理性质定义、影响因素及数据来源, 原油分类及评价方法; 掌握加氢中烃类化合物对主要石油产品组成的贡献与影响, 非烃类化合物对主要石油产品质量、过程设备、过程操作及环境影响; 学习石油产品分类, 汽油、柴油、润滑油等主要油品的化学组成、物理性质; 掌握主要石油产品使用性能与化学组成的关系, 化学组成的分析与标准。

14.化工安全技术(多)(课程代码: 0002963)

本课程 44 学时, 应得学分 2.5。《化工安全技术(多)》是石化专业的一门限选课。主要学习化工危险物质的分类标准、化工企业防火防爆基本知识和方法等内容。通过学习, 使学生掌握化工行业各类危险物质的控制及防火防爆基本知识, 树立安全生产意识。

15.《化工专业英语》(课程代码:)

本课程 22 学时, 应得学分 2.0。主要讲授化学基础知识、化工单元操作、石油加工工艺、环境保护等知识, 侧重实际工艺及操作, 为提高学生的专业英语阅读、翻译和写作能力; 本课程还介绍了专业英语的特点和学习方法。

16.危险化学品安全(课程代码: 0004915)

本课程 22 学时, 应得学分 1.0。《危险化学品基础知识》是石油化工技术专业的一门限选课。具体内容包括危险化学品基础知识, 危险化学品包装、危险化学品经营、危险化学品使用、危险化学品事故应急救援等。本课程主要针对当前安全生产、劳动保护存在的突出问题, 通过“听读”形式, 深入浅出, 生活化地向学生普及基本的安全生产法律法规知识与安全知识, 以及基本的应急救援常识。

17.《油气工艺及设备(少)》(课程代码: 01049231)

本课程 22 学时, 应得学分 1.0。主要讲授油气基本工艺和设备工作原理、油气平面布置、管带计算基础; 油库油罐、管道、阀门、及其他设备的工作原理、结构、使用和维护知识, 使学生熟悉油田的一般常识, 熟悉降低油品损耗的原理及相关设备。

(三) 岗位能力类课程

1.无机化学实验技术(课程代码: 0005949)

本课程 25 学时, 应得学分 2.0。《无机化学实验技术》是学习无机化学理论知识的基础上, 开设综合性实验课程, 主要学习实验室及石油化工生产过程中的安全知识、化学试剂的正确使用、仪器的使用、无机产品合成、分离、纯化及产品称量等知识和基本操作技能, 使学生能够独立完成从原料到产品全过程的设计和操作, 培养学生准确选择和使用化学实验仪器设备, 组装实验仪器、选择合成路线、正确处理实验数据等综合实验技术能力。

2.有机化学实验技术(课程代码: 0005956)

本课程 25 学时, 应得学分 2.0。《有机化学实验技术》是一门在学习有机化学理论知识的基础上, 开设的实验课。主要学习有机化合物安全知识, 石油化工生产网络、产品的合成、分离、纯化、产品称量及相关仪器设备的选择和使用, 通过有机化学

集中实验, 使学生掌握催化剂选择、反应温度控制、原料配比、装置选择等合成知识和操作技能; 蒸馏、分馏、萃取、升华等分离知识操作技能, 为专业实训打下良好基础。

3.化学分析实训(课程代码: 0005931)

本课程 50 学时, 应得学分 4.0。《化学分析实训》是学习掌握无机化学及分析化学理论知识的基础上, 开展的实践课。主要学习样品的采集和治理、称量和量、样品溶解、转移及定容, 样品的测定等知识和操作方法, 分析数据的处理方法。重点掌握分析天平的使用、酸碱滴定、氧化还原滴定、配合物滴定、沉淀滴定的操作和数据处理方法。

4.CAD 实训(少)(课程代码: 0106918)

本课程 25 学时, 应得学分 2.0。《CAD 实训(少)》学生根据指导教师提供的零件草图和零件装配图, 在教师指导下上机绘制二维 CAD 图, 并指导教师审核后由绘图机打印出图。通过实训, 不断提高学生计算机的绘图操作技能。

5.化工单元仿真实训 I(课程代码: 0005924)

本课程 25 学时, 应得学分 2.0。《化工单元仿真实训 I》主要内容有: 离心单元、换热器单元、液位单元、管式加热炉单元 4 个实训模块, 练习 4 个单元过程的开车、停车及典型事故处理操作。通过本课程的学习, 掌握化工基本单元过程 DCS 控制原理和方法, 为学生后续专业装置操作打下基础。

6.化工单元仿真实训 II(课程代码: 0005925)

本课程 25 学时, 应得学分 2.0。《化工单元仿真实训 II》主要内容有: 精馏单元、吸收解吸单元两个实训模块, 练习 2 个单元过程的开车、停车及典型事故处理操作。通过本课程的学习, 掌握精馏过程与吸收解吸过程 2 个化工基本单元过程 DCS 控制原理和方法, 为学生后续专业装置操作打下基础。

7.化工单元操作实训(多)(课程代码: 0005921)

本课程 50 学时, 应得学分 4.0。《化工单元操作实训(多)》主要内容有: 流体流动类型与雷诺数的关系确定、流体机械能转化、流体流动阻力的测定、离心泵特性曲线等八个实训模块。通过本课程的学习, 使学生进一步强化石油单元操作过程的相关理论知识, 掌握石油化工单元设备的操作方法及异常现象的处理, 培养学生的动手能力、发现问题、分析和解决问题的能力, 提高学生的职业素养。

8.化工检修管理实训(课程代码: 0104931)

本课程 25 学时, 应得学分 1.0。《化工检修管理实训》是非机械专业的实践课程, 主要学习离心泵、换热器、化工管路等设备的拆卸、组装技能; 通过实训, 使学生熟悉基本化工设备的主要结构; 了解化工检修基本知识、应用及安全技术规范; 学会正确使用常用工具; 基本掌握化工检修基本操作技能。

9.石化厂认识实习(课程代码: 0005947)

本课程 25 学时, 应得学分 1.0。认识实习是高职院校人才培养方案中非常重要的实践教学环节, 通过实习使学生认识化工生产基本过程, 建立化工企业生产过程的感性认识, 认知化工典型设备与过程, 学习企业文化, 加深学生对所学专业理解, 为后续专业课程的学习打下基础。

11.油品分析实训(多)(课程代码: 0005954)

本课程 50 学时, 应得学分 4.0。本课程通过实训进一步熟悉油品的质量标准, 学习汽油、柴油、润滑油、沥青等产品的典型指标试验方法, 使学生掌握石油产品分析的相关操作技术, 熟悉油品分析的操作过程及其影响因素, 强化对油品分析质量控制意识, 具备油品质量判断能力。

12.催化重整仿真实训(少)(课程代码: 0005908)

本课程 50 学时, 应得学分 4.0。学习催化重整装置开工准备、开车、正常操作、事故操作, 正常停车等基本步骤、方法、调节手段、控制方法, 学习 DCS 控制在石油化工过程中的应用。

13.原油常压蒸馏装置实训(课程代码: 0005919)

本课程 25 学时, 应得学分 2.0。《原油常压蒸馏装置实训》是石油化工技术专业重要的实训课程之一。本课程的主要内容有: 常压蒸馏装置的开车、停车的操作。通过本课程的学习, 学生不但能掌握原油的工艺流程、控制、关键设备的结构与调节及安全系统参数调节, 应急事故的分析与处理等核心内容, 而且通过亲自观察, 动手操作与调试, 不断提高学生理解分析工艺流程图的能力; 操作化工生产装置的控制能力; 分析数据的处理能力, 实现零距离上岗。

14.化工安全实训(课程代码: 0009682)

本课程 25 学时, 应得学分 2.0。《化工安全实训》主要通过模拟化工生产装置运行过程中的典型事故, 并进行事故处理过程技能训练, 使学生更真实的感受安全在化工生产中的重要性, 不断强化安全意识。

15.油库生产实训(课程代码: 0104939)

本课程 25 学时, 应得学分 1.0。本课程学习油品装卸、原油加热、油品调合、油品脱水等操作原理和操作过程。

(四) 岗位训练类课程《校企共同制定课程标准》

1.常减压装置生产技术(课程代码:)

本课程 450 学时, 应得学分 18.0。根据企业工作岗位安排, 在常减压装置进行为期一学期(18 周)的跟岗训练, 在企业导师及校内导师的指导下, 采用跟岗训练的学习方式, 学习常减压装置的工艺流程、主要设备操作原理、装置运行参数、操作规程、正常运行状态控制与调节, 常见事故的分析与处理过程等, 经过 1 学期的跟岗训练掌握常减压装置全流程操作工作岗位的知识要求和技能要求, 经过企业导师与校内导师的考核评定, 达到合格上岗工作。

2.加氢裂化装置生产技术(课程代码:)

本课程 450 学时, 应得学分 18.0。根据企业工作岗位安排, 在加氢裂化装置进行为期一学期(18 周)的跟岗训练, 在企业导师及校内导师的指导下, 采用跟岗训练的学习方式, 学习加氢裂化装置的工艺流程、主要设备操作原理、装置运行参数、操作规程、正常运行状态控制与调节, 常见事故的分析与处理过程等, 经过 1 学期的跟岗训练掌握加氢裂化装置全流程操作工作岗位的知识要求和技能要求, 经过企业导师与校内导师的考核评定, 达到合格上岗工作。

3.加氢精制装置生产技术(课程代码:)

本课程 450 学时, 应得学分 18.0。本课程 450 学时, 应得学分 18.0。根据企业工作岗位安排, 在加氢精制装置进行为期一学期(18 周)的跟岗训练, 在企业导师及校内导师的指导下, 采用跟岗训练的学习方式, 学习加氢精制装置的原理、装置运行参数、操作规程、正常运行状态控制与调节, 常见事故的分析与处理过程等, 经过 1 学期的跟岗训练掌握加氢精制装置全流程操作工作岗位的知识要求和技能要求, 经过企业导师与校内导师的考核评定, 达到合格上岗工作。

4.芳烃联合装置生产技术(课程代码:)

本课程 450 学时, 应得学分 18.0。本课程 450 学时, 应得学分 18.0。根据企业工作岗位安排, 在芳烃联合装置进行为期一学期(18 周)的跟岗训练, 在企业导师及校内导师的指导下, 采用跟岗训练的学习方式, 学习芳烃联合装置的工艺流程、主要设备操作原理、装置运行参数、操作规程、正常运行状态控制与调节, 常见事故的分析与处理过程等, 经过 1 学期的跟岗训练掌握芳烃联合装置全流程操作工作岗位的知识要求和技能要求, 经过企业导师与校内导师的考核评定, 达到合格上岗工作。

5.柴油加氢装置生产技术(课程代码:)

本课程 450 学时, 应得学分 18.0。本课程 450 学时, 应得学分 18.0。根据企业工作岗位安排, 在柴油加氢装置进行为期一学期(18 周)的跟岗训练, 在企业导师及校内导师的指导下, 采用跟岗训练的学习方式, 学习柴油加氢装置的工艺流程、主要设备操作原理、装置运行参数、操作规程、正常运行状态控制与调节, 常见事故的分析与处理过程等, 经过 1 学期的跟岗训练掌握柴油加氢装置全流程操作工作岗位的知识要求和技能要求, 经过企业导师与校内导师的考核评定, 达到合格上岗工作。

6.灵活催化装置生产技术(课程代码:)

本课程 450 学时, 应得学分 18.0。本课程 450 学时, 应得学分 18.0。根据企业工作岗位安排, 在灵活催化装置进行为期一学期(18 周)的跟岗训练, 在企业导师及校内导师的指导下, 采用跟岗训练的学习方式, 学习灵活催化装置的工艺流程、主要设备操作原理、装置运行参数、操作规程、正常运行状态控制与调节, 常见事故的分析与处理过程等, 经过 1 学期的跟岗训练掌握灵活催化装置全流程操作工作岗位的知识要求和技能要求, 经过企业导师与校内导师的考核评定, 达到合格上岗工作。

7.航煤加氢装置生产技术(课程代码:)

本课程 450 学时, 应得学分 18.0。本课程 450 学时, 应得学分 18.0。根据企业工作岗位安排, 在航煤加氢装置进行为期一学期(18 周)的跟岗训练, 在企业导师及校内导师的指导下, 采用跟岗训练的学习方式, 学习航煤加氢装置的工艺流程、主要设备操作原理、装置运行参数、操作规程、正常运行状态控制与调节, 常见事故的分析与处理过程等, 经过 1 学期的跟岗训练掌握航煤加氢装置全流程操作工作岗位的知识要求和技能要求, 经过企业导师与校内导师的考核评定, 达到合格上岗工作。

8.公用工程(课程代码:)

本课程 450 学时, 应得学分 18.0。本课程 450 学时, 应得学分 18.0。根据企业工作岗位安排, 在公用工程系统进行为期一学期(18 周)的跟岗训练, 在企业导师及校内导师的指导下, 采用跟岗训练的学习方式, 学习公用工程系统的

图 6 2018 级石油化工技术专业（现代学徒制）人才培养方案课程设置

2018级石油化工技术专业人才培养方案课程设置及教学进程安排表																				
专业：石油化工技术（现代学徒制）		培养层次：专科		日期：2018.05																
序号	课程类别	课程代码	课程名称	学分	总学时	学时构成				周学时分布						考核方式	备注	说明		
						讲	实	上	其											
										1(13)	2(11)	3(11)	4(12)	5(0)	6(0)					
1	职业素质类课程	必修	0206913	思想道德修养与法律基础	3	52	33					3					考试			
2	职业素质类课程	必修	0206901	毛泽东思想和中国特色社会主义理论体系概论	2	33	33					3					考试			
3	职业素质类课程	必修	0206902	毛泽东思想和中国特色社会主义理论体系概论	2	36	36						3				考试			
4	职业素质类课程	必修	0206912	形势与政策	1	16	16						2				考试		8周每周2课时	
5	职业素质类课程	必修	0002903	职业素养	1.5	22	22						2				考试			
6	职业素质类课程	必修	180204	就业创业	1.5	24	24						2				考试			
7	职业素质类课程	必修	0503901	数学应用与实践	3	52	52					4					考试			
8	职业素质类课程	必修	0705901	高职实用英语 I	5	78	78					6					考试			
9	职业素质类课程	必修	0705902	高职实用英语 II	5	44	44					4					考试			
10	职业素质类课程	必修	0204910	体育与健康 I	1.5	26	26					2					考试			
11	职业素质类课程	必修	0204911	体育与健康 II	1.5	22	22						2				考试			
12	职业素质类课程	必修	0502901	计算机操作技术	4	78						78					考试		理实一体化	
13	职业素质类课程	必修	0207901	高职语文听说写	1.5	33	33						3				考试			
14	职业素质类课程	必修	0002901	公共安全	1	10	10							2			考试		5周每周2课时	
15	职业素质类课程	必修	H303	大学生心理健康教育	1	16	16										考试		尔雅通识课	
16	职业素质类课程	必修	E069	中华优秀传统文类课程	1	16	16										考试		尔雅通识课	
17	职业素质类课程	必修	E036	创新创业类课程	1	16	16										考试		尔雅通识课	
18	职业素质类课程	必修	180408	入学教育及军训	1							1周					考试			
19	职业素质类课程	必修	180401	公益劳动	1								1周				考试			
20	职业素质类课程	必修	180409	大学生国防教育	1	18	12	6					2				考试		其余6学时在军训	
小计一					37.5	592	489	6	78	22	20	12	5	9						
1	专业知识类课程	限选课	0604903	无机化学	3	52	52					4					考试			
2	专业知识类课程	限选课	0106908	化工制图(中)	2	44	44						4				考试			
3	专业知识类课程	限选课	0603922	分析化学	2	44	44						4				考试			
4	专业知识类课程	限选课	0604908	有机化学(多)	4	78	78								6		考试		★	
5	专业知识类课程	限选课	0604902	化工信息检索(少)	1	24	24										考试			
小计二					49	852	852					10	22	20	24					
1	岗位能力类课程	限选课	0005949	无机化学实验技术	2	25		25					1周				考试		★	
2	岗位能力类课程	限选课	0005956	有机化学实验技术	2	25		25						1周			考试		★	
3	岗位能力类课程	限选课	0005931	化学分析实验	4	50		50						2周			考试			
4	岗位能力类课程	限选课	0106918	CAD实训(少)	2	25		25						1周			考试		★	
5	岗位能力类课程	限选课	0005924	化工单元仿真实训 I	2	25		25						1周			考试		★	
6	岗位能力类课程	限选课	0005925	化工单元仿真实训 II	2	25		25						1周			考试		★	
7	岗位能力类课程	限选课	0005921	化工单元操作实训(多)	4	50		50						2周			考试		★	
8	岗位能力类课程	限选课	01049311	化工检修钳工实训	1	25		25						1周			考试		★	
9	岗位能力类课程	限选课	0005904	常减压装置仿真实训	2	25		25						1周			考试		★	
10	岗位能力类课程	限选课	0005947	石化厂认识实习	1	25		25						1周			考试		融入企业文化教育	
11	岗位能力类课程	限选课	0005955	油品分析实训(少)	2	25		25						1周			考试		★	
12	岗位能力类课程	限选课	0104939	油库生产实训	1	25		25						1周			考试		★	
13	岗位能力类课程	限选课	00059301	化工总控工取证实训(少)	2	25		25						1周			考试		★	
14	岗位能力类课程	限选课	0605919	原油常压蒸馏装置实训	2	25		25						1周			考试		★	
15	岗位能力类课程	限选课	0005962	化工安全实训	2	25		25						1周			考试		★	
16	岗位能力类课程	限选课	0605918	柴油加氢实训仿真实训	2	25		25						1周			考试		★	
小计三					33	450		450					1周	5周	7周	5周	4周			
1	跟岗训练类课程	任选课		常减压装置生产技术	18	450		450									18周	考查		
2	跟岗训练类课程	任选课		加氢裂化装置生产技术	18	450		450									18周	考查		
3	跟岗训练类课程	任选课		加氢精制装置生产技术	18	450		450									18周	考查		
4	跟岗训练类课程	任选课		芳烃联合装置生产技术	18	450		450									18周	考查		
5	跟岗训练类课程	任选课		柴油加氢装置生产技术	18	450		450									18周	考查		
小计四					30	750		750									18周			
合计					149.5	2642	1324	1206	78	22	1周	6周	7周	5周	18周	12周				
					学时构成				周学时分布											
					学	总	讲	实	上	其	1	2	3	4	5	6				
					分	学	时	时	时	时										
课程类别一					职业素质类课程模块	37.5	592	472	6	78	22	20	12	5	9					
课程类别二					专业知识类课程模块	49	850	852												
课程类别三					岗位能力类课程模块	33	450		450											
课程类别四					跟岗训练类课程模块	30	750		750											
合计					149.5	2642	1324	1206	78	22	30	34	25	33						
总学时：2642					理论与实践课程比例：852:1200=0.71:1.0				毕业学分（下限）：149.5											
说明：1. 第一至第五学期上课周数分别为14、17、18、17、18，其中考试周已扣除，请在表中的“？”处注明第一至第五学期的理论课上课周数。2. 专业核心课程在说明一栏标注★，含跨系、跨专业共享实训项目课程在说明一栏标注☆。3. 表格中周时的统计按照可安排学时统计。4. 理论课时比实践教学学时多专业理论知识课程、岗位能力类课程和职业拓展类课程中理论课时和实践课学时的比，理论课时指课堂讲授学时，实践教学时指集中实训、理实一体化课、上机、实验等学时。																				
校内修订人：焦林宏 赵立祥 企业修订人：张崇林 董雪云 审核人：李薇（校内） 俞霖（企业）																				

图 7 石油炼制技术专业恒逸（现代学徒制）人才培养方案

石油炼制技术专业人才培养方案

恒逸（现代学徒制）单招版

专业名称：石油炼制技术
专业代码：570202

一、专业简介

石油炼制技术专业始建于 1956 年，在 50 多年中，全日制石油炼制技术（石油炼制）专业办学历程一直延续至今，从未中断。在此基础上，又逐渐发展了业余和职工、学历和非学历石油炼制技术继续教育（由职工大学教育方向发展而来），形成目前，以学历教育为主，多种形式并存的石油炼制技术职业教育模式，为我国石油炼制、石油化工行业输送了大量应用型专业技术和管理人才。

石油炼制技术专业建设和发展的理念是：以职业岗位需求和国家职业资格标准为导向；采用“双定向、四模块、校企共育”的校企合作现代学徒制人才培养模式；坚持工学结合课程建设和教学模式；贯彻基于职场工作过程设置课程建设和课程教学设计；坚持“产-学-研”相结合的专业发展模式。

石油炼制技术专业是以石油和天然气为原料生产燃料油、润滑油及相关产品。本专业学生主要从事石油炼制、石油化工企业生产一线高级操作、生产管理、产品销售、实用技术开发等相关工作。

石油炼制专业设置的主要核心课程有：无机及分析化学、有机化学、物理化学、化工单元过程及设备、石油及产品概念、燃料油生产技术、润滑油生产与应用、化工设备基础、工业仪表自动化、化学实验技术实训、化工单元操作及仿真实训、炼油工艺及装置前仿真实训等。

石油炼制技术专业目前能够使用实训实训基地主要有：化学实验技术实训基地、化工单元操作实训基地、工业分析与检测实训基地、石油炼制生产性实训基地、自行设计与与相关公司共同建设了国内一流的 DCS 控制反应-精馏装置、化工中试及石化产品开发实训基地；加强校外实训基地建设，充分利用学院长期的行业背景及良好的个人与企业关系，主要针对石油炼制技术专业的协议型和共建型校外实训基地 6 个。

二、专业培养目标

本专业培养理想信念坚定，德技并修，全面发展，具有一定的科学文化水平、良好的职业道德和工匠精神、较强的实践能力，具有支撑终身发展、适应时代要求的关键能力，掌握石油炼制专业的专业知识和技术技能，面向石油炼制及石油化工等行业，能够从事石油炼制生产、产品检测、装置维护及生产管理等工作的高素质技术技能人才。

三、学制、招生对象、适用范围

学制：三年
招生对象：高中、中职毕业（单招招生）
适用范围：2018 级

四、就业方向

1. 岗位

石油炼制技术专业培养毕业生主要从事的职业岗位有：燃料油生产各岗位；润滑油生产及应用各岗位。

另外，根据所学的知识、具备的素质和拥有的能力，石油炼制技术专业的学生可以从事石油及产品分析检测岗位、石油化工生产各岗位、石化产品销售岗位及相关工业生产、管理及服务岗位等。

2. 承担工作

①原料及产品分析、检测和评价工作；
②炼油生产装置各岗位操作。
③化工装置操作。

所属专业大类（代码）	所属专业类（代码）	对应行业（代码）	主要职业类（代码）	主要岗位类群（技术技能领域、举例）	职业资格（职业资格证书、证书举例）
生物与化工大类（57）	化工技术类（5702）	石油、煤炭及其他燃料加工业（25）	石油炼制生产人员（6-10-01）、其他石油加工和精炼、基础化学原料制造人员（6-11-02）	1. 生产装置操作 2. 总控操作 3. 设备管理维修 4. 化工产品销售及服务 5. 与未业领域 6. 化工产品开发 7. 职业岗位	化工总控工

五、人才培养规格要求

(一) 职业岗位能力要求

①能阅读和理解有关技术报告及管理文件，并能阅读装置工艺流程图及设备简图。
②能对生产进行全面的安全生产检查，提出并落实安全措施，确保安全生产；能对常见事故进行正确判断及处理；能理解并执行事故处理预案与紧急停车方案。
③能对典型炼油装置进行简单物料平衡、能量平衡、压力平衡等计算，能进行简单的经济核算。
④能及时发现和消除生产中各种安全隐患，正确分析、判断和处理异常现象和重大事故。
⑤能进行典型炼油装置各岗位的开车及正常运行操作，能协调各岗位操作。
⑥能掌握典型炼油装置中主要设备、工艺参数控制仪器（软件）的使用方法及各操作要点。石油炼制技术专业职业岗位能力分解及要求见表-1。

能力类型	能力分解	能力要求
操作技能	工艺操作能力	①能熟练进行全装置各岗位的开车及正常运行操作，不停车的方法和步骤，协调各岗位操作； ②能进行全装置各岗位的倒换操作，使生产技术和经济指标在先进合理的范围内； ③能结合全装置各岗位的生产状况，组织经济措施的实施，保证及时发现和消除生产中各种安全隐患，正确分析、判断和处理异常现象和重大事故并提出预防和改造措施。

工具设备的使用与操作能力	知识要求	能力要求
对生产进行全面的安全生产检查，提出并落实安全措施，确保安全生产。发生事故时能判断、事故处理预案与紧急停车方案。	①设备的使用方法及操作要点； ②设备完好标准与维护保养； ③能按全装置各岗位的设备名称、电、仪、计算机系统以及仪器仪表的大小、中修项目和改造方案； ④能按在车间进行工艺装置的安全施工及检查验收等工作。	能按基本要领，正确、熟练地掌握基础知识；工艺过程流程图、给煤基础知识，能控制工艺流程图；识读设备结构图等。

（二）职业岗位知识结构要求

①了解炼油生产装置各岗位使用的电器仪表系统及计算机、计量器具的规格、型号、一般结构工作原理及使用知识。

②了解炼油装置各岗位使用的全部工器具设备名称、规格、型号、构造、性能、材质、各品配件、造型要求及使用知识；了解设备维护保养基础知识，设备安全使用常识；设备故障知识。

③了解炼油装置运行记录、交接班记录、设备维护保养记录及其他相关记录等知识。

④掌握与石油炼制技术专业有关的无机化学、有机化学、分析化学、化工过程及原理等专业基础知识。

⑤掌握流体输送、传热、精馏、萃取、吸收等基本原理及相关计算知识。

⑥掌握石油及油品化学组成和理化性质、汽油、航煤、柴油及润滑油等主要产品产品的使用性质、石油及产品物理性质、使用性能与化学组成的关系等知识。

⑦掌握原油蒸馏、催化裂化、催化重整、催化加氢、润滑油生产、油品精制与调合等典型炼油装置原料及产品组成和性质、工艺原理及流程等知识。

石油炼制技术专业职业岗位知识结构及要求见表-2。

知识类型	知识结构	知识要求内容
职业素质	职业素养	职业素质基本知识
基础	基础知识	与本专业有关的无机化学、有机化学、分析化学、化工过程及原理及计算机应用操作与应用
	安全及环保知识	安全技术知识、环保基础知识、安全生产、工业卫生及环保的法律、法规
岗位	石油及产品基础知识	石油及产品的化学组成、物理性质、石油产品使用性能
	化工基础知识	流体力学基础知识、传热基础知识、传热及蒸馏、精馏基础知识。

（三）职业素养要求

1. 基本素质要求

①坚持正确的政治方向，遵纪守法，诚实守信。
②具有正确的认识理念与认知方法、实事求是、勇于实践的工作作风、自强自立自爱、有正确的审美观、情趣高雅、较高的文化修养。
③具有良好的思想道德素质和正确的人生观、世界观和价值观，爱岗敬业，忠于职守。
④具有良好的职业道德素质、正确的工作态度和良好的团队意识、敬业爱岗、诚实守信。
⑤具有良好的人文科学素质，养成良好的兴趣爱好和终身学习的习惯，修身养性，读万卷书。

⑥具有良好的身心素质，坚持体育锻炼和健康的文艺活动，磨炼意志，体魄健壮，达到大学生体质健康标准。

2. 职业态度要求

①注重职业道德的培养，爱岗敬业，忠于职守，按章操作，确保生产、认真负责，诚实守信，团结协作，相互尊重，节约成本，降耗增效，精益求精，一丝不苟，遵守规章，重视安全，吃苦耐劳，廉洁创业，节约成本，降耗增效，保护环境，文明生产，不断学习，努力创新。

②具有较强的求知欲，乐于、善于使用科学技术方法解决日常工作、社会交流、专业技术方面的问题。

③具有实事求是、尊重自然规律的科学态度，不迷信权威和教条，乐于通过亲力实践、检验、判断各种专业论断和技术问题以及社会现实问题。

④在专业工作中，认识到交流与合作的重要性，有将自己的见解公开并与他人交流的愿望，看与别人合作的团队精神，敢于提出与别人不同的见解，也勇于放弃或修正自己的错误观点。

⑤能认识科学及其技术对于社会发展、自然环境及人类生活的影响，有可持续发展的意识，能在个人能力所及的范围对社会的可持续发展有所贡献。

⑥在专业学科工作中，既要尊重市场经济观念，也要有将科学服务于人类的意识，有理想、有抱负、热爱祖国，有振兴中华的使命感和责任感。

（四）职业资格证书与等级证书要求

- 燃料油生产工、分离岗位操作工、化工总控工及分析工职业资格证书
- 取得全国计算机信息高新技术考试合格证书（必取）
- 取得高等学校英语应用能力考试合格证书（必取）

(五) 毕业学分要求
 依据本专业综合职业能力要求,并参照教育部高职高专学分管理的有关规定,本专业毕业学分须达到以下要求:
 本专业毕业学分须达到134.5分以上,其中,专业主干课程学分须达到所占比例的90%,达不到者,不得毕业。

六、课程体系建设

(一) 典型工作任务分析
 1. 培养进程设计
 根据石油炼制技术一线操作岗位工作过程,设计石油炼制技术培养进程,对于培养进程遵循:
 人文社科及公共基础教学→专业理论教学→专业技能实训→专业拓展训练
 基础→相关课程→专业课程→实际生产过程的培养进程。
 对于职业素养和职业技能培养遵循:职业素养→职业技能。
 其中职业素养培养遵循:
 职业素养→岗位素质
 人文素养→职业道德-职业素养
 基本素质→拓展素质的培养进程
 其中职业技能培养遵循:职业能力→岗位技能的培养进程。
 2. 课程进程设计
 以燃料油生产技术课程为例遵循:
 原料→生产过程→产品
 原料:来源→配方→组成和性质→评价→处理
 生产过程:原理方法-工艺流程-影响因素分析-生产过程控制操作及方法
 产品:规格-组成和性质-评价
 (二) 针对岗位能力确定课程
 石油炼制技术岗位素质、能力与课程之关系见表-3。

表-3 岗位素质、能力与课程关系

素质和能力类别	素质和能力要点	课程位置
职业素质	人文素养	社会和职业人所需文化素质和身体素质
	职业素质	毛泽东思想、邓小平理论、三个代表、科学发展观、大学语文
岗位素质	职业素质	思想道德与职业修养
	基本素质	职业道德、心理与心理素质
职业能力	拓展素质	化工安全管理、心理安全教育、体育、计算机、数学
	基础能力	安全与环保意识和技术措施、资料阅读与查找
基础能力	石油化工大类职业能力基础	无机及分析化学、有机化学、物理化学、化学实验技术、化工单元及操作、化工应用基础、化工力学与节能技术

3	化工单元操作	流体性质、输送方法、输送设备、热力学定律、换热器、加热炉、节能方法及措施、传热、塔器、吸收等单元操作及方法、影响因素、设备结构及性能、控制方法	培养炼油、化工基本单元操作技能掌握能力、单元过程操作技能掌握能力	120学时 6.5学分
4	石油及产品概述	原油化学组成、物理性质、分类及评价;石油产品分类、化学组成、物理性质、使用功能及产品规格标准;原油加工方案及过程。	培养石油及产品化学组成表示方法、物理性质描述及与化学组成关系分析、石油产品使用性能与化学组成和物理性质之间关系分析能力。	72学时 4.5学分
5	燃料油生产技术	主要燃料油(汽油、柴油、重油)、主要原油馏油(常压馏油、催化裂化、加氢裂化、催化重整、催化加氢等)主要生产过程原理、方法及生产控制过程。	培养炼油装置生产过程系统掌握能力和操作能力。	60学时 4学分

注:各专业主干课程一般不多于5门。
 (二) 主要实训课程简介
 石油炼制技术专业主要实训课程见表-5。

表-5 石油炼制技术专业主要实训课程简介

序号	实训名称	课程主要内容	培养能力	建议学时(学分)
1	化学实验技能实训	基本无机、有机、物理及分析化学实验技能训练	培养学生具有查阅文献资料、准确选择和使用化学实验仪器设备、规范实验仪器、选择实验路线、正确处理实验数据等综合实验技能能力。	75学时 4.5学分
2	油品分析实训	石油原料及产品性质和质量检测及评价标准、方法、操作	培养评价油品主要化学组成、物理性质及使用性能指标的检测能力及对原油及产品性能的评价能力。	50学时 4学分
3	化工单元操作实训	基本化工单元设备结构、性能测试及操作	培养基本化工单元理论与实际操作技能、实际问题分析与解决问题的能力。	50学时 4学分
4	化工单元仿真实训	基本化工单元设备结构、及仿真操作	培养基本化工单元理论与实际操作技能、DCS控制基本化工单元操作能力。	50学时 4学分
5	常减压装置仿真实训	常减压装置工业过程仿真操作	培养原油蒸馏过程理论与实际操作技能、原油蒸馏生产装置DCS控制操作能力。	25学时 2学分

职业能力及岗位要求	职业能力及岗位要求		术
	相关能力	石油炼制技术类专业职业能力	炼油设备及机械基础、化工仪表与控制
基本能力	工艺条件准备	识读并绘制等控制点的工艺流程图;绘制主要设备结构简图;识读工艺配管图;识记工艺技术指标、规范文件	化工过程设计案例、化工绘图、炼油设备及机械基础、化工仪表与控制、化工文献检索、专业外语、化工单元过程课程学习
	设备检查	设备运行油路与检测	炼油设备及机械基础、化工仪表与控制
	物料准备	物料储存、输送与计量	石油及产品储运、炼油设备及机械基础、化工仪表与控制
	巡回操作	炼油过程开工、运行、停工	炼油设备及机械基础、化工仪表与控制、燃料油生产技术、润滑油生产及应用
	设备维护保养	常见化工设备维护与保养	炼油设备及机械基础、化工仪表与控制、燃料油生产技术、润滑油生产及应用
	事故判断和处理	常见事故和突发事件判断与处理	炼油设备及机械基础、化工仪表与控制、燃料油生产技术、润滑油生产及应用
拓展能力	石油化工大类岗位能力	有机化工产品案例、化工过程设计案例、精制加工案例、化工实验设计案例	

七、专业核心课程和主要实训课程简介

(一) 专业核心课程简介
 石油炼制技术专业核心课程见表-4。

表-4 石油炼制技术专业核心课程简介

序号	课程名称	课程主要内容	培养能力	建议学时(学分)
1	无机化学	无机物、有机物、含卤化合物、醇的含氧衍生物、重要的含氮化合物及其衍生物的结构、分类、命名、制备、性质和用途,熟悉重要有机化合物的工业来源、合成方法、制备及应用	培养掌握与石油产品生产的基本无机化学物质性质、合成方法及应用等知识的能力	115学时 7学分
2	物理化学	热力学、动力学、相平衡及溶液、电化学等物理化学基础知识,使学生正确理解和掌握物理化学中基本概念和原理及其实际应用,掌握基本计算方法。	培养对热、功、热过程及能量、物质及相平衡的基本原理和原理的能力	55学时 3.5学分

6	催化重整装置仿真实训	催化重整装置工业过程仿真操作	培养催化重整过程理论与实际操作技能、催化重整生产装置DCS控制操作能力。	50学时 4学分
7	催化裂化装置仿真实训	催化裂化装置工业过程仿真操作	培养催化裂化过程理论与实际操作技能、催化裂化生产装置DCS控制操作能力。	50学时 4学分
8	炼油工艺装置实训	炼油工业过程操作训练	培养基本炼油工业过程理论与实际操作技能、实际问题分析和解决问题的能力。	25学时 2学分
9	原油常压蒸馏装置实训	原油常压蒸馏过程操作训练	培养原油蒸馏工业过程理论与实际操作技能、原油常压生产装置DCS控制操作能力。	25学时 2学分
10	小型提升管催化裂化装置实训	催化裂化工业过程操作训练	培养催化裂化过程理论与实际操作技能、催化裂化生产装置DCS控制操作能力。	25学时 2学分
11	催化加氢装置仿真实训	催化加氢工业过程操作训练	培养催化加氢过程理论与实际操作技能、催化加氢生产装置DCS控制操作能力,以及为参加燃料油大赛奠定基础。	25学时 2学分

八、课程说明

(一) 职业素质课程(课程说明略)
 (二) 专业知识课程
1. 无机化学(课程代码: 0604903)
 52学时, 3学分
 无机化学方面学习目的是通过教学让学生掌握无机化学及分析方面的知识,培养学生分析问题、解决问题的能力,主要为学生今后学习有机化学、分析化学、物理化学及其它专业课程和从事专业技术工作打下一定的基础。内容主要涉及无机化学、物质的状态变化、结构、在溶液中的变化及分析方法,各类型的反应进行的程度、方向、速率及相关计算,元素周期律等。
2. 3. 有机化学 I、II(课程代码: 0604911、0604912)
 118学时, 7学分。
 学习脂肪烃、芳香烃、含卤化合物、重要的含氧化合物、重要的含氮化合物及其衍生物的结构、分类、命名、制备、性质和用途,熟悉重要有机化合物的工业来源、合成方法、性质及用途。
 可分两学期课程
4. 物理化学(课程代码: 0604906)

44学时, 3学分。
学习热力学、动力学、相平衡及溶液、电化学等物理化学基础知识, 要求学生正确理解并掌握物理化学中的基本原理和概念及其运用范围, 掌握基本计算方法。

5. 6. 化工单元过程及设备1、II (课程代码: 260306, 260307)

138学时, 8.5学分。

化工单元过程及设备主要涉及流体输送、传热、精馏、萃取、吸收等方面内容。
学习单元过程的基本原理、特点, 设备工业结构和尺寸, 基本概念和计算方法; 掌握典型单元操作的基本原理, 了解化工厂常用主要设备的结构、工作原理、正确操作方法和常见故障的排除, 能根据生产情况确定合理的工艺结构条件, 了解参数变化对生产过程的影响, 能正确地选择泵、换热器、塔设备等并能确定其主要工艺结构尺寸。

可分两学期授课。

7. 石油及产品概论 (课程代码: 06059061)

72学时, 4.5学分。

石油及产品分主要涉及原油组成、性质、分类及评价, 汽油、航煤、柴油、润滑油等主要产品组成、性质、使用要求及规格, 石油及产品分析方法和标准等方面内容。

学习原油元素、化合物、馏分等组成, 主要物理性质定义、影响因素及数据来源, 原油分类及评价方法; 掌握原油中烃类化合物对主要石油产品组成的贡献及影响, 非烃类化合物对主要石油产品质量、过程设备、过程操作及环境影响。

学习石油产品分类, 汽油、航煤、柴油、润滑油等主要产品使用过程与工艺, 油品化学组成、物理性质; 掌握主要石油产品使用性能与化学组成的关系。

学习石油及产品主要物理性质、化学组成的分析方法与标准。

8. 化工设备基础 (课程代码: 0104913)

48学时, 3学分。

是为化工类专业开设的一门综合性机械类课程, 是该院化工专业的主干技术基础课, 本课程的教学目的通过理论教学和课程设计, 使学生获得基础知识, 掌握设计常压与低压化工容器设备的能力, 标准零部件的选用方法及相关的标准, 了解化工厂常用的典型设备, 如塔设备、换热器、搅拌反应釜等的基本类型及结构, 为毕业设计和今后的工作打好基础。

9. 燃料油生产技术 (课程代码: 0605903)

72学时, 4学分。

燃料油生产技术主要涉及以原油为原料生产汽油、航煤及柴油主要生产过程方面的内容。

学习掌握原油蒸馏、催化裂化、催化重整、催化加氢、燃料油精制及热加工等典型燃料油加工过程的原料及产品物理和化学性质、工艺流程、操作因素分析、过程控制方法, 主要岗位操作, 主要设备结构和特点。

10. 工业仪表自动化 (课程代码: 04049081)

40学时, 2.5学分。

学习控制系统的基本知识, 检测仪表及传感器, 显示仪表, 对象特性, 控制规律和控制制, 执行器, 简单控制系统, 复杂控制系统综合, 计算机控制系统, 典型化工单元控制。

(三) 专业知识拓展课程

1. 石油化工安全技术 (课程代码: 06029003)

44学时, 3学分。

本课程是石油及石化专业的一门课程, 主要学习化工危险物质的分类标准, 化工企业消防的基本知识和方法等内容通过学习, 使学生理解并掌握各部分内容的应知、应会的知识点, 进而为了学生顺利通过技能取证考试奠定良好的基础。

2. 化工制图 (课程代码: 0106908)

48学时, 3学分

学习化工制图的基本知识, 掌握化工管线、主要设备、物料的标准表示方法, 带控制点的工艺流程图, 设备布置图。

3. 石油产品添加剂 (课程代码: 0605905)

20学时, 1.5学分

通过对石油产品添加剂的学习, 让学生了解石油产品品种与添加剂的关系; 掌握石油产品添加剂的种类、作用机理和使用性能及主要品种; 了解添加剂的复合使用及其在汽油、柴油、润滑油等油品中的典型应用; 了解添加剂在燃料油和润滑油中的应用。

4. 输油工艺与设备 (课程代码: 0104913)

40学时, 2.5学分

讲授输油基本工艺流程和设备工作原理、油库平面布置、管径计算、校核及相关标准和规范, 石油库常用阀门、法兰、压力和低温储罐的结构、附件; 管道、阀门及其他设备的原理、结构、选择、使用、维护, 使学生熟悉油库的一般常识; 讲授低油品蒸发损耗的原理、分类与特点, 使学生掌握降低油品蒸发损耗的措施。

5. 重油加工技术 (课程代码: 0605909)

20学时, 1.5学分

学习了解重油组成及特点; 各种重油加工新技术; 重点学习重油催化裂化, 重油加氢, 渣油加氢, 渣油脱沥青等成熟重油加工对原料要求、工艺特点、主要生产工序控制、检测方法等。

6. 石油化工生产技术 (课程代码: 0602913)

40学时, 2.5学分

石油化工工艺的主要内容包括: 七大基本有机化工产品(乙烯、丙烯、丁二烯、苯、甲苯、二甲苯、甲醇)的生产原理、生产条件、工艺流程以及典型设备的结构和工作原理, 通过学习, 使学生把所学理论知识与实际生产相结合, 进一步提高了学生对于各生产工序的日常操作与维护、异常现象判断与处理的能力。

7. 石油炼化专业英语 (课程代码: 0605921)

40学时, 2.5学分

石油炼化专业英语是社会对人才素质要求, 对于石油炼制技术专业学生, 不仅要掌握石油炼制技术专业知识和技能, 而且还要掌握石油炼制技术专业英语, 才能满足大型炼油企业的要求, 石油炼化专业英语使学生通过对石油及石油产品知识、常规装置、催化裂化工艺、催化重整工艺、催化加氢工艺及热加工工艺的学习, 让学生掌握石油炼制英语词汇的构

词解释, 掌握专业英语的特点和学习方法, 掌握专业英语的翻译和写作, 使学生在今后的生产实践中能够熟练阅读专业的先进技术、信息, 提高学生的阅读文献和翻译英文的能力。

(四) 岗位能力课程

1. 石化厂认识实习 (课程代码: 0005947)

25学时, 2.0学分, 1周。

石化厂认识实习是本专业教学过程中的重要环节, 其目的是在主要专业基础课和专业课未学之前, 通过参观炼油实训基地的炼油装置、原油催化蒸馏装置、提升管催化裂化装置以及石化企业及中试生产装置, 对炼油化工企业进行直观的感性接触, 使学生对炼油厂装置有一个初步认识, 了解石油化工业安全知识, 以及对人才的需求情况有一定了解。

2. 无机化学实验技术 (课程代码: 0005949)

本课程 25学时, 应得学分 2.0, 1周。

学习无机化学理论知识的基础上, 开设的综合性的实验课, 主要学习实验室及石油化工生产过程中的安全知识、化学试剂的正确取用、溶液的配制、无机产品合成、分离、纯化及产品检测等知识和基本操作技能, 使学生能够独立完成从原料到产品全过程的设计和制备, 培养学生具有查阅文献资料、准确选择和使用化学实验仪器、组装实验仪器、选择合成路线、正确处理实验数据等综合实验技术能力。

3. 有机化学实验技术 (课程代码: 0005956)

本课程 25学时, 应得学分 2.0, 1周。

有机化学实验技术是一门在学习掌握有机化学理论知识的基础上, 开设的实验课, 主要学习有机化合物安全知识, 石油化工业中中间体、产品的合成、分离、纯化、产品检测知识及相关仪器设备的正确选择和使用, 通过有机化学集中实验, 使学生掌握如何选择、反应温度控制、原料配比、装置选择等合成知识和操作技能, 蒸馏、分馏、萃取、升华等分离知识操作技能, 为专业实训打下良好基础。

4. 物理化学实验技术 (课程代码: 0005960)

本课程 25学时, 应得学分 2.0, 1周。

物理化学实验技术是在学习掌握物理化学理论知识的基础上, 开展的专项综合性实验课, 主要学习化学平衡中热力学、反应速率、平衡常数、分子量、黏度、电导率、旋光率等与物理参数的测定, 相图的控制, 高精度温度控制等仪器设备的使用方法和操作技能, 使学生掌握正确使用仪器测定有关物理参数, 并应用到化工生产过程中, 并能够应用物理化学知识解释化工生产过程中出现的技术问题。

5. 6. 化工单元操作实训1、2 (课程代码: 0005923, 0005923)

50学时, 4.0学分, 2周。

学习单元过程基本实验技能, 培养学生理论联系实际、分析问题和解决问题的能力, 包括流体流动及输送过程, 离心泵特性曲线测定, 雷诺数测定, 流体流动阻力测定, 换热器的操作与总传热系数及膜传热系数的测定, 精馏塔的操作与塔效率的测定, 填料吸收塔的操作及吸收系数的测定, 溢流萃取的操作, 干燥操作及干燥速率曲线的测定, 填料塔的流体物性测定, 板式塔的操作及流体物性现象的观察分析。

分2学期进行。

7. 化工单元仿真实训 (课程代码: 0005904)

25学时, 2.0学分, 1周。

学习石油化工过程基本单元设备及过程的开工准备、开车、正常操作、事故操作、正常停车等基本步骤、方法、调节手段、控制方法, 学习DCS控制在单元过程中的应用。

8. 化工单元仿真实训 (课程代码: 0005905)

25学时, 2.0学分, 1周。

学习石油化工过程基本单元设备及过程的开工准备、开车、正常操作、事故操作、正常停车等基本步骤、方法、调节手段、控制方法, 学习DCS控制在单元过程中的应用。

9. 炼油反应过程仿真实训 (课程代码: 06059001)

25学时, 2.0学分, 1周

炼油反应过程仿真实训是专门对学生进行炼油反应过程DCS仿真操作的课程, 是炼油、化工工艺类专业学习工艺过程的一个核心重要环节, 该课程既属于实践环节又与理论知识紧密相连, 是一个以各类反应器为基础, 以计算机模拟操作为手段的综合教学, 在培养学生专业素养、职业技能、岗位能力等方面有重要作用, 学习炼油及石油化工业过程固定床反应器, 流化床反应和间歇反应等单元设备及过程的开工准备、开车、正常操作、事故操作、正常停车等基本步骤、方法、调节手段、控制方法, 学习DCS控制在单元过程中的应用。

10. 油品分析实训 (课程代码: 0005954)

50学时, 4.0学分, 2周。

学习石油产品组成、性质、分类, 石油产品使用原则和使用要求; 评价指标和方法, 学习分析化学定量的产生及其有差和误差的消除的主要方法, 数据处理及有效数字的意义、位数及其计算, 学习四大滴定分析方法的原理、测定步骤及误差计算, 初步具备选择和建立化学分析方法的能力, 树立准确的“量”的概念。

11. 化工安全实训 (课程代码: 0005902)

25学时, 2.0学分, 1周。

了解个体防护用品的种类, 知道个体防护用品的用法、适用的环境、条件、维护保养方法和使用过程, 也基本掌握了个体防护用品的功能及注意事项, 培养安全向专业技术人员已迫在眉睫, 而如何培养, 则是大家一直关心、探讨的话题, 安全工程学生应该掌握基本安全知识和技能, 专业综合训练给出答案, 通过学习一些相关方面的知识, 可以更加熟练的应用一些安全防护用品, 更加了解安全的重要性, 以及在安全方面已经存在的安全防护技术和不足之处, 使学生进一步获得灵活运用理论知识解决实际问题的能力。

1. 常减压仿真实训 (课程代码: 0005218)

25学时, 2.0学分, 1周。

学习原油常减压工业装置开工准备、开车、正常操作、事故操作、正常停车等基本步骤、方法、调节手段、控制方法, 学习DCS控制在石油化工业过程中的应用。

13. 催化裂化仿真实训 (课程代码: 0005907)

25学时, 2.0学分, 1周

学习催化裂化装置开工准备、开车、正常操作、事故操作、正常停车等基本步骤、方法、调节手段、控制方法, 学习DCS控制在石油化工业过程中的应用。

图 8 2019 年石油炼制技术专业（现代学徒制）人才培养方案课程设置

序 号	课程 类别	课程 代码	课程名称	学 分	总 学 时	学时构成				周学时分布						考 核 方 式	备 注		
						讲 授	实 训	上 机	其 它	一		二		三					
										1 (13)	2 (11)	3 (12)	4 (8)	5 (0)	6 (0)				
1	职业素质类课程	必修	0503901	数学应用与实践	3	52	52				4						考试		
2	职业素质类课程	必修	0705903	高职国际进阶英语1	5	78	78				6						考试		
3	职业素质类课程	必修	0502901	计算机操作技术	5	78			78		6						考试		
4	职业素质类课程	必修	0204910	体育与健康I	1.5	26			26		2						考查		
5	职业素质类课程	必修	H303	大学生心理健康教育	1	16					√						考查		
6	职业素质类课程	必修	180409	大学生国防教育	1	16					√						考查		
7	职业素质类课程	必修	180408	入学教育及军训	1						1周						考查		
8	职业素质类课程	必修	0206913	思想道德修养与法律基础	3	44	22			22	2						考查		
9	职业素质类课程	必修	0705904	高职国际进阶英语II	3	44	44				4						考试		
10	职业素质类课程	必修	0204911	体育与健康II	1	22			22		2						考查		
11	职业素质类课程	必修	0207910	大学语文	1.5	22	22				2						考查		
12	职业素质类课程	必修	E069	中华优秀传统文化类课程	1	16					√						考查		
13	职业素质类课程	必修	180410	劳动教育	1						1周						考查		
14	职业素质类课程	必修	0206901	毛泽东思想和中国特色社会主义理论I	1	24	24					2					考查		
15	职业素质类课程	必修	0705905	高职国际进阶英语III	3	48	48					4					考查		
16	职业素质类课程	必修	0706912	形势与政策	1	16	16					2					考查		
17	职业素质类课程	必修	0002902	职业素养	1	16						√					考查		
18	职业素质类课程	必修	E036	创新创业类课程	1	16						√					考查		
19	职业素质类课程	必修	0206902	毛泽东思想和中国特色社会主义理论II	1	16	16						2				考查		
20	职业素质类课程	必修	2602928	化工责任关怀	1	16							√				考查		
小计一					37	566	322	46	78	22	18	10	8	2					
1	专业知识类课程	限选课	0604904	无机及分析化学	5	78	78				6						考试		
2	专业知识类课程	限选课	0604911	有机化学I	3	52	52				4						考试		
3	专业知识类课程	限选课	0604912	有机化学II	4	66	66					6					考试		
4	专业知识类课程	限选课	0604907	物理化学(少)	3	44	44				4						考试		
5	专业知识类课程	限选课	2603906	化工单元过程及设备I	4	66	66					6					考试		
6	专业知识类课程	限选课	2603907	化工单元过程及设备II(多)	4.5	72	72					6					考试		
7	专业知识类课程	限选课	06059061	石油及产品概论	4.5	72	72					6					考试		
8	专业知识类课程	限选课	0104912	石油炼制设备基础	3	48	48					4					考试		
9	专业知识类课程	限选课	0605903	燃料油生产技术	3	48	48						6				考试		
10	专业知识类课程	限选课	0404908	化工仪表自动化	2	32	32							4			考试		
小计二					36	578	578				10	16	16	10					
1	职业拓展课程	限选课	06029003	石油化工安全技术	3	44	44					4					考查		
2	职业拓展课程	限选课	0106908	化工制图(中)	3	48	48					4					考查		
3	职业拓展课程	限选课	0605905	石油产品添加剂	1	16	16						2				考查		
4	职业拓展课程	限选课	0104923	储罐工艺与设备	2	32	32							4			考查		
5	职业拓展课程	限选课	0605909	重油加工技术	1	16	16							2			考查		
6	职业拓展课程	限选课	0602913	石油化工生产技术	2	32	32							4			考试		
7	职业拓展课程	限选课	0605921	石油炼化专业英语	2	32	32							4			考查		
小计三					14	220	220				0	4	4	16					
1	岗位能力类课程	限选课	0005949	无机化学实验技术	1	25		25				1周					考试		
2	岗位能力类课程	限选课	0005947	石化厂认识实习	2	25		25					1周				考查		
3	岗位能力类课程	限选课	0005956	有机化学实验技术	2	25		25					1周				考试		
4	岗位能力类课程	限选课	0005950	物理化学实验技术	2	25		25					1周				考试		
5	岗位能力类课程	限选课	0005192	化工单元操作实训1	2	25		25					1周				考试		
6	岗位能力类课程	限选课	0005924	化工单元仿真实训I	2	25		25					1周				考试		
7	岗位能力类课程	限选课	0005193	化工单元操作实训2	2	25		25					1周				考试		
8	岗位能力类课程	限选课	0005925	化工单元仿真实训II	2	25		25					1周				考试		
9	岗位能力类课程	限选课	06059001	炼油反应过程仿真实训	2	25		25					1周				考试		
10	岗位能力类课程	限选课	0005954	油品分析实训(多)	4	50		50					2周				考试		
11	岗位能力类课程	限选课	0005962	化工安全实训	2	25		25					1周				考试		
12	岗位能力类课程	限选课	0005218	常减压仿真实训	2	25		25						1周			考试		
13	岗位能力类课程	限选课	0005907	催化裂化仿真实训	4	50		50						2周			考试		
14	岗位能力类课程	限选课	0005908	催化重整仿真实训	4	50		50						2周			考试		
15	岗位能力类课程	限选课	0005961	柴油加氢装置仿真实训	2	25		25						1周			考试		
16	岗位能力类课程	限选课	0605919	原油常压蒸馏装置实训	2	25		25						1周			考试		
17	岗位能力类课程	限选课	0605918	柴油加氢实物仿真实训	2	25		25						1周			考试		
18	岗位能力类课程	限选课	0605916	小型提升管催化裂化装置实训	2	25		25						1周			考试		
19	岗位能力类课程	限选课	0605910	顶岗实习	60	750		750								18周	12周	考试	
小计四					101	1275		1275				1周	5周	6周	9周	18周	12周		
课程类别一	职业素质类课程模块	学 分	总 学 时	学时构成				周学时分布											
				讲 授	实 训	上 机	其 它	一	二	三	四	五	六						
课程类别一	职业素质类课程模块	37	566	322	46	78	22	18	10	8	2								
课程类别二	专业知识类课程模块	36	578	578				10	16	16	10								
课程类别三	专业知识拓展类课程模块	14	220	220				0	4	4	16								
课程类别四	岗位能力类课程模块	101	1275					1周	6周	6周	7周	18周	12周						
合计		188.0	2639	1120	1321	78	22	28	30	28	28								

1.2 课程设置及标准

1.2.1 课程设置

图9 石油炼制技术(文莱炼化班)专业课程设置

Appendices

Appendix 1 - Programme Structure

Table A. Programme structure for Level 5 Diploma in Laboratory Technology.

Session	Module Code	Module Title	Module Type	Credit Value	Remarks	
Year 1	Semester 1	GS1117	Communication Skills for Engineering I	Core	2	PB
		HS1101	Health, Safety, Security & Environment	Core	3	PB
		GS1127	Mathematics for Science	Core	3	PB
		GS1102	Pendidikan Islam	Core	2	PB
		GS1101	Pengajian Melayu Islam Beraja	Core	2	PB
		CL1201	General Chemistry	Essential	3	PB
	Total Credit Value				15	
	Semester 2	GS2117	Communication Skill for Engineering II	Core	2	PB
		CL2203	Analytical Chemistry	Essential	3	PB
		CL2202	Basic Laboratory Skills and Techniques	Essential	3	PB
		CL2208	General Biology	Essential	3	PB
		CL2204	Inorganic Chemistry	Essential	3	PB
			Mandarin (Beginner)	Essential		HY
	Total Credit Value				14	
Year 2	Semester 3	BE1102	Entrepreneurship Basics	Core	2	PB
		CL3203	Analytical Instrumentation	Essential	3	PB
		CL3202	Chemistry Laboratory Techniques	Essential	3	PB
		CL3205	Fundamentals of Organic Chemistry	Essential	4	PB
		CL2207	Biochemistry	Essential	3	PB
		CL3206	Physical Chemistry	Essential	3	PB
		Mandarin (Intermediate)	Essential		HY	
	Total Credit Value				18	
	Semester 4	CL3209	Microbiology	Essential	3	PB
		CL5303	Technology in Petrochemical	Essential	3	HY / LPPC
		IT1201	Information Technology	Essential	3	PB
		CL5305	Oil Analysis	Essential	3	HY / LPPC
		CL2201	Basic Knowledge of Hazardous Chemicals	Essential	3	PB
			Mandarin (Advanced)	Essential		HY
Total Credit Value				15		
Year 3	Semester 5 and 6	PP1101	Chromatographic Analysis	Specialised	5	ON-JOB TRAINING AT HY
		PP1102	Oil Analysis	Specialised	6	
		PP1103	Elemental Analysis	Specialised	5	
		PP1104	Environmental Monitoring	Specialised	5	
		PP1105	Electrochemical Analysis	Specialised	5	
	Total Credit Value				26	
Throughout 3 years programme						
	EM1188	Enrichment	Core	2		
Total Credit Value for the Whole Programme				90		

NOTE: PB - Politeknik Brunei; HY - Hengyi, LPPC - Lanzhou Petrochemical Polytechnic College

DAY	GROUP	1		2		3		LUNCH	4		5		6	
		09:00 - 09:30	09:30 - 09:55	10:00 - 10:30	10:30 - 10:55	11:00 - 11:30	11:30 - 11:55		12:00 - 12:30	12:30 - 13:55	14:00 - 14:30	14:30 - 14:55	15:00 - 15:30	15:30 - 15:55
ATURDAHURSDAEDNESD/JUESDAMONDAY	/J01	Oil Analysis SCV LANDHOU LECTURER							Technology in Petrochemical SCV LANDHOU LECTURER					
	/J02	Oil Analysis SCV LANDHOU LECTURER							Technology in Petrochemical SCV LANDHOU LECTURER					
	/J01	Oil Analysis SCV LANDHOU LECTURER							Technology in Petrochemical SCV LANDHOU LECTURER					
	/J02	Oil Analysis SCV LANDHOU LECTURER							Technology in Petrochemical SCV LANDHOU LECTURER					
	/J01	Oil Analysis SCV LANDHOU LECTURER	Technology in Petrochemical SCV LANDHOU LECTURER		MAJLIS KEUGAMAAN			OCA						
	/J02	Technology in Petrochemical SCV LANDHOU LECTURER	Oil Analysis SCV LANDHOU LECTURER		MAJLIS KEUGAMAAN			OCA						
	/J01	Workshop SCV LT STAFF							Workshop SCV LT STAFF					
	/J02	Workshop SCV LT STAFF							Workshop SCV LT STAFF					

DAY	GROUP	1		2		3		LUNCH	4		5		6	
		09:00 - 09:30	09:30 - 09:55	10:00 - 10:30	10:30 - 10:55	11:00 - 11:30	11:30 - 11:55		12:00 - 12:30	12:30 - 13:55	14:00 - 14:30	14:30 - 14:55	15:00 - 15:30	15:30 - 15:55
ATURDAHURSDAEDNESD/JUESDAMONDAY	/J01	REVISION WEEK							REVISION WEEK					
	/J02	REVISION WEEK							REVISION WEEK					
	/J01	REVISION WEEK							REVISION WEEK					
	/J02	REVISION WEEK							REVISION WEEK					
	/J01	REVISION WEEK							REVISION WEEK					
	/J02	REVISION WEEK							REVISION WEEK					
	/J01	REVISION WEEK		MAJLIS KEUGAMAAN		OCA			OCA					
	/J02	REVISION WEEK		MAJLIS KEUGAMAAN		OCA			OCA					
/J01	Workshop SCV LT STAFF							Workshop SCV LT STAFF						
/J02	Workshop SCV LT STAFF							Workshop SCV LT STAFF						

WEEK 7 : EXAMINATION FOR OIL ANALYSIS AND TECHNOLOGY IN PETROCHEMICAL

DAY	GROUP	1		2		3		LUNCH	4		5		6	
		09:00 - 09:30	09:30 - 09:55	10:00 - 10:30	10:30 - 10:55	11:00 - 11:30	11:30 - 11:55		12:00 - 12:30	12:30 - 13:55	14:00 - 14:30	14:30 - 14:55	15:00 - 15:30	15:30 - 15:55
ATURDAHURSDAEDNESD/JUESDAMONDAY	/J01	BASIC KNOWLEDGE OF INORGANIC CHEMICALS SCV LT STAFF							ANALYTICAL TECHNOLOGY SCV LT STAFF					
	/J02	BASIC KNOWLEDGE OF INORGANIC CHEMICALS SCV LT STAFF							ANALYTICAL TECHNOLOGY SCV LT STAFF					
	/J01	ANALYTICAL TECHNOLOGY SCV LT STAFF							BASIC KNOWLEDGE OF INORGANIC CHEMICALS SCV LT STAFF					
	/J02	ANALYTICAL TECHNOLOGY SCV LT STAFF							BASIC KNOWLEDGE OF INORGANIC CHEMICALS SCV LT STAFF					
	/J01	BASIC KNOWLEDGE OF INORGANIC CHEMICALS SCV LT STAFF							ANALYTICAL TECHNOLOGY SCV LT STAFF					
	/J02	BASIC KNOWLEDGE OF INORGANIC CHEMICALS SCV LT STAFF							ANALYTICAL TECHNOLOGY SCV LT STAFF					
	/J01	WORKSHOP SCV LT STAFF		MAJLIS KEUGAMAAN		OCA			OCA					
	/J02	WORKSHOP SCV LT STAFF		MAJLIS KEUGAMAAN		OCA			OCA					
/J01	WORKSHOP SCV LT STAFF							WORKSHOP SCV LT STAFF						
/J02	WORKSHOP SCV LT STAFF							WORKSHOP SCV LT STAFF						

1.2.2 课程标准

表 1 核心课程标准（英文版）

序号	课程名称	课程标准 编制人
1	Inorganic Chemistry	张雅迪
2	Analytical Chemistry	于娇娇
3	Organic Chemistry	田红
4	Physical Chemistry	王安琪
5	Chemical Unit Process and Equipment 1 and 2	张宇婷
6	Introduction to Oil & Products	张海亮
7	Industrial Instrument Automation	丁炜
8	Fuel Oil Production Technology	孟石
9	Inorganic Chemistry Experiment	张歆婕
10	Organic Chemistry Experiment	魏元博
11	Physical Chemistry Experiment-	田苗
12	Analytical Chemistry Experimental Technique	李晓婷
13	chemical units operation training	韩雅妮-
14	Chemical Unit Simulation-	崔芙蓉
15	Oil Analysis and Training	汪永丽
16	Chemical Safety Training	康小珍
17	Atmospheric and Vacuum Distillation Unit Simulation Training(1)	王红玉
18	Fluid Catalytic Cracking(FCC) Simulation Training	王栋
19	CATALYTIC REFORMING SIMULATION TRAINING	张春兰
20	Diesel Hydrogenation Device Simulation	谢宇洁
21	Refining process equipment training	席满意
22	Crude Oil Distillation Unit Training	马娅
23	DCS REACTION DISTILLATION AND PIOLT PLANT TRAINING	焦林宏
24	Diesel Hydrogen Physical Simulation Training	谢宇洁
25	SMALL-SCALE RISER CATALYTIC CRACKING UNIT TRAINING-2021-12-26(1)	杨兴锴
26	Chemical Equipment Foundation	杨玺庆

PROGRAMME GUIDE
Petroleum Refining Technology

Dec. 2021

- 2) Comprehension of the specifications, models, structures and applications of the electrical instruments, computers, and measuring instruments used in the refining production equipment.
 - 3) Comprehension of the names, specifications, models, structures property, material, spare parts and components of all the tools and devices used in the refining production equipment, as well as the related basic knowledge of maintenance, safe application and corrosion prevention.
 - 4) Comprehension of the records of operation, shifts, maintenance and others of the refining production equipment.
 - 5) Mastery of basic professional knowledge related with the oil refining technology, such as inorganic chemistry, organic chemistry, analytical chemistry, chemical process and principles.
 - 6) Mastery of fundamental principles and related calculation about the fluid transportation, heat transmission, rectification, extraction, and absorption.
 - 7) Mastery of the chemical composition and physicochemical property of petroleum and oils, usability of the main refining products such as gasoline, jet fuel, diesel and lubricant, as well as the relationship among the physical property, usability and chemical composition of petroleum and its products.
 - 8) Mastery of the composition and property of the raw materials used and its products in the typical oil-refining equipment processes such as crude distillation, catalytic cracking, catalytic reforming, catalytic hydrogenation, oil rectification and blending.
- 3. Competency**
- 1) Professional competency
 - Mastery of the fundamental principles and approaches of crude oil and its products: blending, and proper operation of the blending equipment.
 - Mastery of the application method of the analytical and detective equipment for the oil and its products, and the data treatment.
 - Ability to conduct the simple calculation of the material balance, energy balance, and pressure balance as well as simple economical calculation during the typical oil-refining equipment processes.
 - Ability to make overall safety inspection to the production, to raise and conduct safety measures for the purpose of production safety, to conduct correct judgement on and proper treatment for common accidents, to understand and execute the accident handling pre-plans and emergency out-off program.
 - Ability to detect and handle various potential accidents during production; correctly to analyze, judge and handle abnormal phenomena and severe accidents.
 - Ability to conduct the start-up, shut-down and proper operation of the typical oil-refining equipment.
 - Mastery of the usage and operation points of the main equipment, technical parameter and control instruments (softwares) during the typical oil-refining equipment processes.
 - 2) Competency for approaches
 - Ability to read and comprehend related technical reports, management documents, and the technological process diagrams and equipment diagrams.
 - Ability of digital applications.

PROGRAMME OVERVIEW

PROGRAMME OBJECTIVES

The China-Brunai '1+1+1' Hengji petrochemical technology talent joint training project in Lanzhou Petrochemical University of Vocational Technology is a **three (3)** year full-time program. It is designed for China-Brunai '1+1+1' Hengji petrochemical talent training project to cultivate high-quality technical talents who can engage in international oil refining production, product testing, equipment maintenance and production management. The highly qualified technical talents can meet the needs of production, construction, and management of petroleum refining with necessary related professional theoretical, practical knowledge, technical capability as well as favorable vocational ethics, dedication and cross-culture communication ability. They can master the basic and necessary principles and technological processes for manufacturing various fuel oils and petrochemical products with petroleum as materials, have the post operation ability and technical application ability in the process of raw material pretreatment, reaction and product separation in typical oil production.

Upon completion of the programme, the graduate should be able to:

1. Quality

- 1) Cultural quality
 - Favorable scientific humanities quality, good hobbies, interests and habit of lifelong learning to cultivate themselves.
 - Correct cognitive concepts and approaches, true and practical work style, self-independence, self-esteem, with right aesthetic appreciation and cross-cultural communicative quality.
 - Ability to realize the influence of science and related technologies on the social development, natural environment and human lives, as well as recognition of sustainable development to struggle for.
- 2) Vocational quality
 - Professional ethics such as faith, honesty, realistic, innovation and dedication.
 - Being diligent and eager to learn, loving the profession, hardworking, with responsibility, ethics and team spirit.
 - Adhering to the petrochemical enterprise culture and working to match it.
 - Self-cultivated vocational ethics.
 - Dedication and devotion to duty proper operation according to the rules to ensure safety, being serious and responsible, honest and trustworthy, solidarity, cooperation and mutual respect, cost saving, consumption reduction to increase efficiency, Escalator and meticulousity, Abiding by regulations and attaching importance to safety, hard-working, passionate entrepreneurship, environment protect and civilized production.
- 3) Psychological quality
 - Possessing qualified physical and psychological quality, adhering to sports exercises and healthy recreation to strengthen the mind and bodies to reach the students physique and health standards.
 - Awareness of safety and environmental protection.

2. Knowledge

- 1) The core knowledge of the major is the basic oil refining knowledge and its production operation.

- Ability of information acquisition, process and treatment.
- Learning capacity for new knowledge and technology.

ENTRY REQUIREMENT

To gain entry into the China-Brunai '1+1+1' Hengji petrochemical technology talent joint training project, the applicant must fulfil the **minimum** entry requirements of the China-Brunai '1+1+1' Hengji petrochemical technology talent joint training project preferable with the following subjects:

- ◆ Mathematics or Additional Mathematics (Grade 1-B/IGCSE A-C);
- ◆ English Language or English as a Second Language (Grade 1-B/IGCSE A-C);
- ◆ 1 Approved subject in Science related (Grade 1-B/A-E)
- ◆ OR Holds a BDTVEC Skill Certificate 3 (SC 3) or N/Tec with minimum CGPA 2.0 in relevant field
- ◆ OR other equivalent qualifications
- ◆ **AND** Pass interview
- ◆ Graduates with diplomas of high schools, secondary vocational schools or the equivalents.

Certificate will be awarded to students who have satisfactorily fulfilled the requirements stated in the current Academic Policy for **(Diploma or HNTec or N/Tec or BQ)**.

Note: Students who fail to fulfil the above requirements for the award(s) will be issued with an Achievement Transcript only.

CAREER PROSPECT

- 6-10-01(GBM 61001) Production staff for oil refining
- 6-10-99(GBM 61099) Production staff for other oil processing, coking & coal chemical industry.
- 6-11-02(GBM 61102) Manufacturing staff for basic chemical materials.
- 6-11-99(GBM 61199) Manufacturing staff for other chemical materials & products.

PROGRAMME STRUCTURE

Module Code	Module Title	Status	Semester	Credit Value	Module Passing Mark
	Inorganic Chemistry	Professional Knowledge Course	1	2.0	60%
	Analytical Chemistry	Professional Knowledge Course	1	2.0	60%
	Organic Chemistry	Professional Knowledge Course	1	3.0	60%
	Physical Chemistry	Professional Knowledge Course	1	2.0	60%
	Chemical Unit Process and Equipment 1&2	Professional Knowledge Course	1	6.0	60%
	Introduction to Oil & Product	Professional Knowledge Course	1	4.0	60%
	Industrial Instrumentation Automation	Professional Knowledge Course	1	4.0	60%
	Fuel Oil Production Technology	Professional Knowledge Course	1	7.0	60%
	Inorganic Chemistry Experimental Technique	Post Competency Course	1	2.5	60%
	Organic Chemistry Experimental Technique	Post Competency Course	1	2.5	60%
	Physical Chemistry Experimental Technique	Post Competency Course	1	2.5	60%
	Analytical Chemistry Experimental Technique	Post Competency Course	1	2.5	60%
	Chemical Unit Operation Training	Post Competency Course	2	5.0	60%
	Chemical Unit Simulation Training	Post Competency Course	2	2.5	60%
	Oil Analysis and Training	Post Competency Course	2	5.0	60%
	Chemical Safety Training	Post Competency Course	2	2.5	60%
	Atmospheric and Vacuum Distillation Unit Simulation	Post Competency Course	2	2.5	60%
	Fluid Catalytic Cracking (FCC) Simulation Training	Post Competency Course	2	2.5	60%
	Catalytic Reforming Simulation Training	Post Competency Course	2	2.5	60%
	Diesel Hydrogenation Device Simulation Training	Post Competency Course	2	2.5	60%
	Refining Process Equipment Training	Post Competency Course	2	2.5	60%
	Crude Oil Distillation Unit Training	Post Competency Course	2	2.5	60%
	DCS Reaction Distillation and Pilot Plant Training	Post Competency Course	2	2.5	60%
	Diesel Hydrogen Physical Simulation Training	Post Competency Course	2	2.5	60%

	Small Riser Catalytic Cracking Unit Training	Post Competency Course	2	2.5	60%	
	Chemical Equipment Foundation	Post Competency Course	2	5.0	60%	
SUBTOTAL FOR SEMESTER 1					43.0	—
SUBTOTAL FOR SEMESTER 2					37.5	—
SUBTOTAL FOR SEMESTER 3						
INH002	LIFE SKILLS FOR THE PERSONAL DEVELOPMENT	CORE GENERIC	1,2,3,4	-	50%	
-	INDUSTRIAL ATTACHMENT **	CORE SPECIALISED	4	-		
TOTAL					80.5	

Note:
** Industrial Attachment is based on industry working hours to be completed in 6 months.

APPENDIX – Module Descriptions Summaries

Module Code/Title	Description	Assessment																																																																				
INORGANIC CHEMISTRY	This module provides the students the knowledge through teaching, cultivate students' ability to analyze and solve problems. Inorganic chemistry is an important professional basic course for refining and chemical technicians. The course is determined as a required course for refinery technology major according to the total number of class hours and key knowledge points to be mastered in the professional teaching plan.	<table border="1"> <thead> <tr> <th colspan="4">Assessment Schemes</th> </tr> <tr> <th>Assessment Component</th> <th>Assessment Types</th> <th>Performance Objectives</th> <th>Weightage (%)</th> </tr> </thead> <tbody> <tr><td rowspan="3">Introduction</td><td>Question</td><td>PO1.1</td><td>5%</td></tr> <tr><td>Question</td><td>PO1.2</td><td>10%</td></tr> <tr><td>Assignment</td><td>PO1.3</td><td>5%</td></tr> <tr><td rowspan="3">Chemical Kinetics</td><td>Question</td><td>PO2.1</td><td>5%</td></tr> <tr><td>Question</td><td>PO2.2</td><td>5%</td></tr> <tr><td>Assignment</td><td>PO2.3</td><td>5%</td></tr> <tr><td rowspan="3">Chemical Equilibrium</td><td>Question</td><td>PO2.4</td><td>5%</td></tr> <tr><td>Question</td><td>PO3.1</td><td>5%</td></tr> <tr><td>Assignment</td><td>PO3.2</td><td>5%</td></tr> <tr><td rowspan="3">Acid-base Equilibria</td><td>Question</td><td>PO3.3</td><td>5%</td></tr> <tr><td>Question</td><td>PO3.4</td><td>5%</td></tr> <tr><td>Assignment</td><td>PO3.5</td><td>10%</td></tr> <tr><td rowspan="3">Acid-base Equilibria</td><td>Question</td><td>PO3.6</td><td>10%</td></tr> <tr><td>Question</td><td>PO4.1</td><td>5%</td></tr> <tr><td>Assignment</td><td>PO4.2</td><td>10%</td></tr> <tr><td rowspan="3">Acid-base Equilibria</td><td>Question</td><td>PO4.3</td><td>10%</td></tr> <tr><td>Question</td><td>PO4.3</td><td>10%</td></tr> <tr><td>Assignment</td><td>PO4.3</td><td>10%</td></tr> </tbody> </table>	Assessment Schemes				Assessment Component	Assessment Types	Performance Objectives	Weightage (%)	Introduction	Question	PO1.1	5%	Question	PO1.2	10%	Assignment	PO1.3	5%	Chemical Kinetics	Question	PO2.1	5%	Question	PO2.2	5%	Assignment	PO2.3	5%	Chemical Equilibrium	Question	PO2.4	5%	Question	PO3.1	5%	Assignment	PO3.2	5%	Acid-base Equilibria	Question	PO3.3	5%	Question	PO3.4	5%	Assignment	PO3.5	10%	Acid-base Equilibria	Question	PO3.6	10%	Question	PO4.1	5%	Assignment	PO4.2	10%	Acid-base Equilibria	Question	PO4.3	10%	Question	PO4.3	10%	Assignment	PO4.3	10%
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	Assignment	PO4.3	10%																																																																			
ANALYTICAL CHEMISTRY	Analytical chemistry is an important basic course for chemical engineering majors. Analytical chemistry is an independent chemical science which studies the composition, state, content and structure of substances. It is an important branch of chemistry. Analytical chemistry can be divided into qualitative analysis and	<table border="1"> <thead> <tr> <th colspan="4">Assessment Schemes</th> </tr> <tr> <th>Assessment Component</th> <th>Assessment Types</th> <th>Performance Objectives</th> <th>Weightage (%)</th> </tr> </thead> <tbody> <tr><td rowspan="2">Introduction of Analytical Chemistry</td><td>Test</td><td>PO 1.1</td><td>5%</td></tr> <tr><td>Practical</td><td>PO 1.2</td><td>5%</td></tr> <tr><td rowspan="2">Errors</td><td>Test</td><td>PO 2.1</td><td>5%</td></tr> </tbody> </table>	Assessment Schemes				Assessment Component	Assessment Types	Performance Objectives	Weightage (%)	Introduction of Analytical Chemistry	Test	PO 1.1	5%	Practical	PO 1.2	5%	Errors	Test	PO 2.1	5%																																																	
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		Introduction of Analytical Chemistry	Test	PO 1.1	5%																																																																	
			Practical	PO 1.2	5%																																																																	
		Errors	Test	PO 2.1	5%																																																																	

Module Code/Title	Description	Assessment																																																																											
Organic Chemistry	Organic Chemistry is an important basic course for chemical engineering majors. Through the study of this course, students can master the composition, structure, properties, change laws, synthesis methods and related theoretical problems of organic matter, lay a good foundation for the follow-up courses of corresponding majors, and also play a good supporting role for students to successfully pass the skill evidence.	<table border="1"> <thead> <tr> <th colspan="4">Assessment Schemes</th> </tr> <tr> <th>Assessment Component</th> <th>Assessment Types</th> <th>Performance Objectives</th> <th>Weightage (%)</th> </tr> </thead> <tbody> <tr><td rowspan="3">Fundamentals of Titrimetric Analysis</td><td>Practical</td><td>PO 2.2</td><td>10%</td></tr> <tr><td>Assignment</td><td>PO 2.3</td><td>10%</td></tr> <tr><td>Test</td><td>PO 3.1</td><td>5%</td></tr> <tr><td rowspan="3">Acid-Base Titrations</td><td>Practical</td><td>PO 3.2</td><td>10%</td></tr> <tr><td>Assignment</td><td>PO 3.3</td><td>5%</td></tr> <tr><td>Test</td><td>PO 4.1</td><td>5%</td></tr> <tr><td rowspan="3">Other Titration Methods</td><td>Practical</td><td>PO 4.2</td><td>10%</td></tr> <tr><td>Assignment</td><td>PO 4.5</td><td>10%</td></tr> <tr><td>Test</td><td>PO 5.1</td><td>5%</td></tr> <tr><td rowspan="3">Other Titration Methods</td><td>Practical</td><td>PO 5.2</td><td>10%</td></tr> <tr><td>Assignment</td><td>PO 5.3</td><td>5%</td></tr> </tbody> </table>	Assessment Schemes				Assessment Component	Assessment Types	Performance Objectives	Weightage (%)	Fundamentals of Titrimetric Analysis	Practical	PO 2.2	10%	Assignment	PO 2.3	10%	Test	PO 3.1	5%	Acid-Base Titrations	Practical	PO 3.2	10%	Assignment	PO 3.3	5%	Test	PO 4.1	5%	Other Titration Methods	Practical	PO 4.2	10%	Assignment	PO 4.5	10%	Test	PO 5.1	5%	Other Titration Methods	Practical	PO 5.2	10%	Assignment	PO 5.3	5%																														
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			Organic Chemistry	Organic Chemistry mainly studies the classification, naming, composition, structure, physical and chemical properties, preparation methods and applications of alkanes, olefins, alkynes, dienes, aromatic hydrocarbons, halogenated hydrocarbons, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and their derivatives, nitrogen-containing organic compounds.	<table border="1"> <thead> <tr> <th colspan="4">Assessment Schemes</th> </tr> <tr> <th>Assessment Component</th> <th>Assessment Types</th> <th>Performance Objectives</th> <th>Weightage (%)</th> </tr> </thead> <tbody> <tr><td rowspan="3">Introduction and review</td><td>Assignment</td><td>PO 1.1</td><td>2%</td></tr> <tr><td>Practical</td><td>PO 1.2</td><td>4%</td></tr> <tr><td>Test</td><td>PO 1.8</td><td>2%</td></tr> <tr><td rowspan="3">Alkanes</td><td>Practical</td><td>PO 2.1</td><td>5%</td></tr> <tr><td>Assignment</td><td>PO 2.3</td><td>2%</td></tr> <tr><td>Test</td><td>PO 2.4</td><td>2%</td></tr> <tr><td rowspan="3">Alkenes</td><td>Practical</td><td>PO 3.1</td><td>4%</td></tr> <tr><td>Assignment</td><td>PO 3.3</td><td>1%</td></tr> <tr><td>Test</td><td>PO 3.6</td><td>2%</td></tr> <tr><td rowspan="3">Alkynes</td><td>Assignment</td><td>PO 3.7</td><td>2%</td></tr> <tr><td>Assignment</td><td>PO 4.1</td><td>1%</td></tr> <tr><td rowspan="3">Dienes</td><td>Practical</td><td>PO 4.2</td><td>5%</td></tr> <tr><td>Practical</td><td>PO 4.4</td><td>5%</td></tr> <tr><td>Test</td><td>PO 4.8</td><td>2%</td></tr> <tr><td rowspan="3">Aromatic Hydrocarbons</td><td>Practical</td><td>PO 5.1</td><td>3%</td></tr> <tr><td>Practical</td><td>PO 5.4</td><td>3%</td></tr> <tr><td>Assignment</td><td>PO 5.5</td><td>1%</td></tr> <tr><td rowspan="3">Alcohols</td><td>Practical</td><td>PO 6.1</td><td>1%</td></tr> <tr><td>Practical</td><td>PO 6.2</td><td>1%</td></tr> <tr><td>Test</td><td>PO 6.7</td><td>4%</td></tr> </tbody> </table>	Assessment Schemes				Assessment Component	Assessment Types	Performance Objectives	Weightage (%)	Introduction and review	Assignment	PO 1.1	2%	Practical	PO 1.2	4%	Test	PO 1.8	2%	Alkanes	Practical	PO 2.1	5%	Assignment	PO 2.3	2%	Test	PO 2.4	2%	Alkenes	Practical	PO 3.1	4%	Assignment	PO 3.3	1%	Test	PO 3.6	2%	Alkynes	Assignment	PO 3.7	2%	Assignment	PO 4.1	1%	Dienes	Practical	PO 4.2	5%	Practical	PO 4.4	5%	Test	PO 4.8	2%	Aromatic Hydrocarbons	Practical	PO 5.1	3%	Practical	PO 5.4	3%	Assignment	PO 5.5	1%	Alcohols	Practical	PO 6.1	1%	Practical	PO 6.2	1%
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MODULE [XXX00]	INORGANIC CHEMISTRY
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December 2021

TABLE OF CONTENT

MODULE INFORMATION	1
SKILL AREA	4
1.0 Introduction: Matter and measurement	4
1.1 Review of inorganic chemistry	4
1.1 Understand inorganic chemistry and basic parameters	4
1.2 Gas	4
1.3 Properties of solution	4
2.0 Chemical Kinetics	5
2.1 Factors that affect reaction rates	5
2.2 Reaction rates	5
2.3 Rate laws and the Arrhenius equation	5
2.4 Catalysts	5
3.0 Chemical Equilibrium	6
3.1 The concept of equilibrium	6
3.2 The equilibrium constant	6
3.3 Working with equilibrium constants	6
3.4 Heterogeneous equilibria	6
3.5 Calculation and application of equilibrium constants	6
3.6 Le Châtelier's principle	6
4.0 Acid-base Equilibria	7
4.1 Acids and bases: A brief review	7
4.2 The pH scale	7
4.3 Weak acids/bases	7

MODULE INFORMATION

Module code	IBTE TO FILL
Module title	Inorganic Chemistry
Module status	IBTE TO FILL
Credit value	2.0
Module passing mark	60%
Module start date	IBTE TO FILL
Module expiry date	IBTE TO FILL
Module review date	2021/12/19
Details of the relationship between the module and relevant national occupational standard or other professional standards or curricula (if applicable)	Module status – Inorganic chemistry is an important professional basic course for refining and chemical technicians. The course is determined as a required course for refinery technology major according to the total number of class hours and key knowledge points to be mastered in the professional teaching plan.
	Module nature – Inorganic chemistry is a professional theoretical course.
	Module function – Inorganic chemistry lays a foundation for the follow-up physical chemistry, analytical chemistry and inorganic chemistry experiment, etc.
	National vocational skill standards & professional standards – Inorganic chemistry is to enable students to master the knowledge of inorganic chemistry through teaching, cultivate students' ability to analyze and solve problems.
Applicable specialty – This course is applicable to petrochemical technology, petroleum refining technology, industrial analysis technology, polymer synthesis technology and other petrochemical related majors.	

Aims of the module

1	Knowledge objectives: <ul style="list-style-type: none"> - Calculate common chemical parameters such as density, Kelvin temperature and amount of substance. - Learn about the properties of gas and solution - Learn and calculate reaction rate and master factors that affect reaction rate. - Grasp the concept of acid and base and acid-base dissociation equilibrium
2	Vocational skill objectives: <ul style="list-style-type: none"> - Be able to accurately use the basic concepts of mass of substance, molar mass of substance, molar concentration of substance, molar volume of gas to carry out relevant calculations; - Can calculate the pH and dissociation degree of a weak acid and weak base solution; - Be able to write standard equilibrium constant expressions and carry out relevant chemical equilibrium calculations; - Can judge the influence of concentration, temperature and pressure on chemical equilibrium;
3	Professional quality cultivation objectives: <ul style="list-style-type: none"> - Train students to care about social problems, cherish resources, care for the environment, rational use of chemical substances. - Train students to carry forward the scientific spirit of cooperation, diligent in thinking, rigorous and realistic, brave in innovation and practice. - Cultivate students' professional quality of love and dedication, bearing hardships and standing hard work.

Teaching and Learning Strategies

1	Before class: The questions are given to the students before class, and the students use their spare time to think and prepare.
2	In class: Classroom teaching enables students to systematically learn the basic concepts, theories and methods of inorganic and analytical chemistry, and cultivate their logical reasoning and rational thinking abilities. Discussion part is mainly to inspire students to think deeply, greatly mobilize the enthusiasm and initiative of students to apply what they have learned.
3	Exercise class: Exercise class is mainly to consolidate the knowledge taught in class, deepen the understanding and mastery of concepts, and teach students how to solve problems.

Assessment Schemes

Assessment Component	Assessment Types	Performance Objectives	Weightage
Introduction: Matter and Measurement	Question	PO 1.1	5%
	Question, Assignment	PO 1.2	10%

MODULE [XXX00]	ANALYTICAL CHEMISTRY
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December 2021

MODULE INFORMATION

Module code	IBTE TO FILL
Module title	Analytical Chemistry
Module status	IBTE TO FILL
Credit value	2.0
Module passing mark	60%
Module start date	IBTE TO FILL
Module expiry date	IBTE TO FILL
Module review date	2021/12/22

<p>Details of the relationship between the module and relevant national occupational standard or other professional standards or curricula (if applicable)</p>	<p>Module status – Analytical chemistry is an important basic course for chemical engineering majors. Analytical chemistry is an independent chemical science which studies the composition, state, content and structure of substances. It is an important branch of chemistry. Analytical chemistry can be divided into qualitative analysis and quantitative analysis.</p> <p>Module nature – Analytical chemistry is a basic course.</p> <p>Module function – Chemical analysis teaching not only can make students master the basic theory, principle and method of analysis, but also improves their comprehensive quality and lays a solid foundation for learning other professional courses.</p> <p>National vocational skill standards & professional standards – Chemical inspector</p> <p>Applicable specialty – This course is applicable to petrochemical technology, petroleum refining technology, analytical test technology, polymer synthesis technology and other petrochemical related majors.</p>
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Aims of the module	
1	<p>Knowledge objectives:</p> <ul style="list-style-type: none"> - Be familiar with the basic theories, principles and analytical methods of analytical chemistry. - Master the expression method and calculation method of error in quantitative analysis, master the effective number and its operation rules. - Familiarize with the mechanism, analytical procedure and result calculation of the titrimetric analysis methods. - Puts emphasis on learning the fundamental principles of four titration analysis methods as well as their applications.
2	<p>Vocational skill objectives:</p> <ul style="list-style-type: none"> - Combine theoretical knowledge with practice closely to acquire the ability to analyze and solve problems. - Master the measurement method of volume and weight. - Grasp the calculation process of titration analysis results. - The ability to theoretically analyze general chemical production problems and consult reference materials.
3	<p>Professional quality cultivation objectives:</p> <ul style="list-style-type: none"> - Cultivate students' ability to integrate theory with practice, organically combine the basic theories and experimental methods of analytical chemistry, and solve scientific problems related to chemistry. - Cultivate students' awareness of environmental protection and safety, cultivate students' good scientific research habits and realistic scientific research attitude. - Cultivate students' scientific spirit of diligent thinking, rigorous and realistic, innovation and practice.

Teaching and Learning Strategies	
1	<p>Project-based Teaching method: take specific case application as the carrier to carry out the teaching process, adopt the way of learning with practice, and fully reflect the principle of "learning for application".</p>
2	<p>Inquiry Teaching method: teachers put forward comprehensive problems, guide students to discuss and analyze, put forward solutions according to the set conditions, and cultivate students' ability to think independently, explore and solve problems. Set discussion topics before class, organize and implement in class, and expand and explore after class.</p>
3	<p>Heuristic teaching method: increase teaching links such as group discussion, group cooperation and question answering, cultivate students' ability to think, analyze and solve problems, cultivate students' ability to consult materials, cultivate students' practical ability and innovation ability, fully respect students' dominant position in teaching, and give full play to teachers' leading role in teaching. Guide and encourage students to acquire knowledge.</p>

	through practice and self-study, and fully mobilize students' subjective initiative.
4	<p>Task driven teaching method: provide students with situations related to teaching tasks, carry out learning around tasks, and test and summarize the learning process with the completion results of tasks.</p>

Assessment Schemes			
Assessment Component	Assessment Types	Performance Objectives	Weightage
Introduction of Analytical Chemistry	Test	PO 1.1	5%
	Practical	PO 1.2	5%
Errors and Data Treatment	Test	PO 2.1	5%
	Practical	PO 2.2	10%
	Assignment	PO 2.3	10%
Fundamentals of Titrimetric Analysis	Test	PO 3.1	5%
	Practical	PO 3.2	10%
	Assignment	PO 3.3	5%
Acid-Base Titrations	Test	PO 4.1	5%
	Practical	PO 4.2	10%
	Assignment	PO 4.3	10%
Other Titration Methods	Test	PO 5.1	5%
	Practical	PO 5.2	10%
	Assignment	PO 5.3	5%

List of Recommended Facilities/Equipment and Materials	
1	Teaching equipment: Video, animation and other multimedia resources, network teaching platform.
2	Teaching Venue: Multimedia classroom.

List of Recommended Books	
1	Analytical chemistry, Deqiang Xia, et al., Lanzhou Petrochemical university and Vocational Technology.
2	Analytical Chemistry and Quantitative analysis, David S.Hage James D Carr., Chemical Industry Press.
3	Principles and Practice of Analytical Chemistry, F.W Field, et al., Chemical Industry Press.

PROGRAMME GUIDE FOR DIPLOMA IN CHEMICAL ENGINEERING

CHEMICAL UNIT PROCESS AND EQUIPMENT I			
Credit Value	4 CV	Module Type	Essential
Minimum Contact Hours	120 hours		
Aims	The aims of this module are to: <ul style="list-style-type: none"> Develop an understanding of the processes of momentum transfer (fluid mechanics). Be aware of the basic equations of fluid flow, heat transfer, and mass transfer and be able to apply these equations to practical unit operations. Obtain a practical, working knowledge of common unit operations in chemical engineering such as evaporation, absorption/stripping, distillation, extraction, and drying. 		
Learning Objectives	Upon successful completion of this module students will be able to: <ol style="list-style-type: none"> Apply Fluid statics to solve practical problems Master Newton's law of viscosity Apply Fluid dynamics to solve practical problems Master Mechanism of Heat Transfer Conduct heat transfer process calculations. 		
Contents	Topics: <ol style="list-style-type: none"> Basic knowledge of Unit Operations of Chemical Engineering Fluid statics and its applications Newton's law of viscosity Fluid dynamics and its applications Transportation of Fluids Mechanism of Heat Transfer Application of Heat Transfer. 		
Assessment	Coursework 60% Examination 40%		

Chemical Unit Process and Equipment II			
Credit Value	4 CV	Module Type	Essential
Minimum Contact Hours	120 hours		
Aims	The aims of this module are to prepare the students with basic knowledge of processes and equipment of chemical unit operations.		
Learning Objectives	Upon successful completion of this module students will be able to: <ol style="list-style-type: none"> Understand the fundamental principles, equipment structure of each unit operation, master the basic methods of process calculation and equipment selection, ways of process intensification; Familiar with operation of each unit process with understanding of the principles behind; Develop ideas and concepts of engineering, such as technical feasibility, economic rationality, production safety, etc. 		
Contents	Topics: <ol style="list-style-type: none"> Distillation Gas Absorption 		
Assessment	Coursework 30% Final examination 70%		

Petrochemical Production Technology			
Credit Value	3 CV	Module Type	Essential
Minimum Contact Hours	90 hours		
Aims	The aims of this module are to: <ul style="list-style-type: none"> Familiar with production process of petrochemical products Ability to analyze and operate production conditions 		
Learning Objectives	Upon successful completion of this module students will be able to: <ol style="list-style-type: none"> Master the nature and use of the basic organic chemical raw materials and their derivatives. Master the methods of production, determination of operating conditions and selection of Process Scheme. Have the professional accomplishment of senior worker in chemical craft position. 		
Contents	Topics: <ol style="list-style-type: none"> Basic knowledge of petrochemical production Petroleum hydrocarbon cracking technology. Production of typical petrochemical products. Light aromatics (BTX) Butene production technology. Operation and control method of chemical production technology process. 		
Assessment	Coursework 60% Examination 40%		

PLOYMER PRODUCTION TECHNOLOGY			
Credit Value	3 CV	Module Type	Essential
Minimum Contact Hours	90 hours		
Aims	The aims of this module are to: <ul style="list-style-type: none"> Master the basic theoretical knowledge of polymer production technology. Master the typical production process of common polymers. Understand the responsibilities of each position in the polymer production process. 		
Learning Objectives	Upon successful completion of this module students will be able to: <ol style="list-style-type: none"> Master theoretical knowledge of polymer production technology. Master the typical production process of polymers, such as PE, PP, PVC et. al. Select the appropriate polymerization process, according to different properties of polymers. Able to identify different kinds of materials. Master the responsibilities of each position in the polymer production process. 		
Contents	Topics: <ol style="list-style-type: none"> Basic theoretical knowledge of polymer production technology. Production technology of Polyethylene(PE). Production technology of Polyvinyl chloride(PVC). Production technology of Polypropylene(PP). Production technology of styrene butadiene rubber(SBR). Production technology of Polyester. Production technology of Nylon. 		
Assessment	Coursework 60% Examination 40%		

INDUSTRIAL INSTRUMENT AUTOMATION			
Credit Value	3 CV	Module Type	Essential
Minimum Contact Hours	90 hours		
Aims	<p>The aims of this module are to:</p> <ul style="list-style-type: none"> Understand the common measurement methods of main industrial process parameters. Familiar with the basic working principle, main characteristics and use methods of common measuring instruments and control instruments. Understand the basic knowledge and type of control system. 		
Learning Objectives	<p>Upon successful completion of this module students will be able to:</p> <ol style="list-style-type: none"> Know how to use the instrument and where it is used. Familiar with the structure and type of automatic control system. Master the operation of automatic control system and the setting method of controller parameters. Understand the control cases of typical chemical units. 		
Contents	<p>Topics:</p> <ol style="list-style-type: none"> Basic knowledge of automatic control system Detection instrument and sensor Object properties Control law and controller Actuator Simple control system Introduction of complex control system Control case of typical chemical unit 		
Assessment	Coursework 60% Examination 40%		

Chemical Unit Operation Training			
Credit Value	2 CV	Module Type	Essential
Minimum Contact Hours	60 hours		
Aims	<p>The aims of this module are:</p> <ul style="list-style-type: none"> Knowledge objective: the basic principle of each training project, the structure and working principle of typical chemical equipment. Vocational skills objectives: master the structure, principle and operation of typical chemical equipment, understand the process of training equipment. Professional quality: through analyzing and arranging the experimental data, cultivate the students' attitude of seeking truth from facts, cultivate the students' team spirit through the practical operation of many students, and promote them to develop division of labor and cooperation. Stick to the good habit of post and lay a good foundation for future work. 		
Learning Objectives	<p>Upon successful completion of this module students will be able to:</p> <ol style="list-style-type: none"> Determination of characteristic curve of centrifugal pump Measurement of Parallel Operation and Characteristic Curve of Centrifugal Pump Various common heat exchangers's operation and Heat Transfer Coefficient Measurement Understand the structure and working principle of packed absorber Understand the process of the absorber Understanding the Principle of Distillation and the Concept of Total the structure of sieve plate distillation column 		
Contents	<p>Topics:</p> <ol style="list-style-type: none"> Determination of characteristic curve of centrifugal pump. Characteristic Curve of Centrifugal Pump Heat Exchanger's Operation and Heat Transfer Coefficient Measurement Structure and working principle of packed absorber The Principle of Distillation and the operation of the rectifying tower 		
Assessment	Coursework 60% Training Report 40%		

Practical training of Petroleum Hydrocarbon Pyrolysis Unit			
Credit Value	1 CV	Module Type	Essential
Minimum Contact Hours	30 hours		
Aims	<p>The aims of this module are to:</p> <ul style="list-style-type: none"> Master the basic operating skills of petrochemical process equipment Master the formulation and adjustment methods of process parameters and the working principle of equipment 		
Learning Objectives	<p>Upon successful completion of this module students will be able to:</p> <ol style="list-style-type: none"> Master the process flow of Petroleum Hydrocarbon Pyrolysis Unit Master the startup and shutdown of Petroleum Hydrocarbon Pyrolysis Unit Through professional training, have the ability of problem analysis and resolve 		
Contents	<p>Topics:</p> <ol style="list-style-type: none"> Operation of Pyrolysis Unit. Operation of Quick Oil Unit. Operation of Quick Water Unit. The common hitches and handling methods 		
Assessment	Coursework 60% Examination 40%		

Practical training of Pyrolysis Gas Compression Device			
Credit Value	2 CV	Module Type	Essential
Minimum Contact Hours	60 hours		
Aims	<p>The aims of this module are to:</p> <ul style="list-style-type: none"> Master the basic operating skills of petrochemical process equipment Master the formulation and adjustment methods of process parameters and the working principle of equipment 		
Learning Objectives	<p>Upon successful completion of this module students will be able to:</p> <ol style="list-style-type: none"> Master the process flow of Pyrolysis Gas Compression Unit Master the startup and shutdown of Pyrolysis Gas Compression Unit Through professional training, have the ability of problem analysis and resolve 		
Contents	<p>Topics:</p> <ol style="list-style-type: none"> The Process Flow of Pyrolysis Gas Compression Startup and shutdown of Pyrolysis Gas Compression Unit The common hitches and handling methods 		
Assessment	Coursework 60% Examination 40%		

Training of Pyrolysis Gas Separation Unit			
Credit Value	1 CV	Module Type	Essential
Minimum Contact Hours	30 hours		
Aims	The aims of this module are to: <ul style="list-style-type: none"> Master the basic operating skills of petrochemical process equipment Master the formulation and adjustment methods of process parameters and the working principle of equipment 		
Learning Objectives	Upon successful completion of this module students will be able to: <ol style="list-style-type: none"> Master the process flow of Pyrolysis Gas Separation Unit Master the startup and shutdown of Pyrolysis Gas Separation Unit Through professional training, have the ability of problem analysis and resolve 		
Contents	Topics: <ol style="list-style-type: none"> The Process Flow of Pyrolysis Gas Separation Unit Startup and shutdown of Pyrolysis Gas Separation Unit The common hitches and handling methods 		
Assessment	Coursework 60% Examination 40%		

CRUDE OIL DISTILLATION UNIT TRAINING			
Credit Value	1 CV	Module Type	Essential
Minimum Contact Hours	30 hours		
Aims	This course is a professional training course for students majoring in petroleum refining technology and petrochemical technology. Through practical training, students can master the theoretical knowledge and simulation operation skills of the first process of Petroleum Processing - crude oil distillation process, enhance their chemical operation skills and hands-on ability, so that students' understanding of the training device can be extended to the understanding of large-scale plant in the factory. Through more systematic training to cultivate their own hands-on ability, chemical operation ability, problem-solving ability and innovative thinking ability, to lay a solid foundation for learning other refining processes.		
Learning Objectives	Through more systematic training of this programme students will be able to: <ol style="list-style-type: none"> Cultivate their own hands-on ability, Enhance chemical operation ability, Improve problem-solving ability and innovative thinking ability Lay a solid foundation for learning other refining processes. 		
Contents	Topics: <ol style="list-style-type: none"> To understand the general situation and characteristics of atmospheric and vacuum distillation production. Master the main process of atmospheric and vacuum production. Master the properties of raw materials, basic principles, process conditions, influencing factors and control methods of key products, principles of process combination and production management methods. Understand material balance, energy balance and other process calculation in production process. 		
Assessment	Coursework 60% Examination 40%		

Thermal Cracking of Petroleum Hydrocarbon Training			
Credit Value	2 CV	Module Type	Essential
Minimum Contact Hours	60 hours		
Aims	The aims of this module are to: <ul style="list-style-type: none"> Master the basic operating skills of petrochemical process equipment Master the formulation and adjustment methods of process parameters and the working principle of equipment. 		
Learning Objectives	Upon successful completion of this module students will be able to: <ol style="list-style-type: none"> Master the principles and process flow of Ethylene production. Master the startup and shutdown of Thermal Cracking of Petroleum Hydrocarbon Through professional training, have the ability of problem analysis and resolve 		
Contents	Topics: <ol style="list-style-type: none"> The Process Flow of Thermal Cracking of Petroleum Hydrocarbon Startup and shutdown of Thermal Cracking of Petroleum Hydrocarbon Simulation Unit The common hitches and handling methods 		
Assessment	Coursework 60% Examination 40%		

ATMOSPHERIC AND VACUUM DISTILLATION UNIT SIMULATION TRAINING			
Credit Value	2 CV	Module Type	Essential
Minimum Contact Hours	60 hours		
Aims	The aims of this course: <ul style="list-style-type: none"> Be Skilled in the principle and process flow of crude oil atmospheric and vacuum distillation. Grasp the working principle of the main equipment of atmospheric and vacuum distillation unit, the formulation and adjustment method of process parameters. Familiar with cold start and normal stop operation of the system. 		
Learning Objectives	Upon successful completion of this course, students will be able to: <ol style="list-style-type: none"> Grasp the basic principle, process flow and main equipment of atmospheric and vacuum distillation unit Learn the basic operation skills of oil refining and chemical process. Master the common accident emergency treatment method. 		
Contents	Topics: <ol style="list-style-type: none"> Process and Principle of Atmospheric and Vacuum Distillation Unit. Cold start-up of atmospheric and vacuum distillation unit. Shutdown of atmospheric and vacuum distillation unit Accident Treatment of Atmospheric and Vacuum Distillation Unit Write a training report 		
Assessment	Process Assessment: Basic principles(20)+cold start(20)+normal stop (10)+accident handling(20)+ training report(10)+professional accomplishment(20)		