



## THE REFORM AND PRACTICE IN CULTIVATION PATTERN AND COURSE SYSTEM FOR MARITIME EDUCATION AND TRAINING OF THE 21<sup>ST</sup> CENTURY

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### ABSTRACT

Since 1996, the reforming of MET's cultivation pattern and course system, as one of the national projects in higher education, has begun in order to meet the needs of amended international convention and the needs of new century. The paper will introduce the MET's situation of reforming in recent years in China.

The rapid development of world economy and science and technology puts new requirements on the knowledge, ability and quality structure of the cadets. This kind of requirements is more urgent to maritime education with internationalized characteristics. Tens of thousands of high-level seafarers have been trained successfully under the old cadets cultivation pattern of maritime education in the past several decades in China, but the old pattern can not meet the needs of social development any longer under the new situation. The problem that the seafarers trained under the old pattern cannot meet the needs of the shipping industry has become more and more serious. Shipping companies and respective institutions appeal strongly for the navigation education to speed up its reform.

The reform is planned to derive from the broad background of international maritime education with full consideration of shipping enterprise's needs native and abroad, consult the practice of international navigation colleges and universities, and get guidance from STCW95 and native laws and regulations on seafarer's education. It studies the competence requirement and training scheme

of seafarers and probes into training aims and training standards for seafarers, and puts forward suggestions on seafarers training program --- recommended teaching plan.

### 1. THE BASIS AND GUIDING PRINCIPLES

This reform mainly considers the following points:

- 1) The establishment and development of China's socialist market economy requires higher education to make all-round adaptation and improvement, and maritime education should also meet this need accordingly.
- 2) Science and technology have highly developed, knowledge economy has just emerged and the competition of national power has become more and more severe, so maritime education must have a good preparation for the new challenge.
- 3) The eastward moving of international shipping market brings new opportunity for China's maritime education and summons challenge as well. Only when the seafarers accord with the requirements of international standards (STCW78/95) and the regulations for seaman's training and education of the People's Republic of China, can they have the power to compete in the international shipping market.

While studying and formulating cultivating plan for cadets, people should follow the following guiding ideology. (a) Reflect the spirit of the day---"facing the modernization,

facing the world and facing the future". (b) Adhere to the principle that knowledge, ability and quality should be developed coordinately and improve comprehensively. (c) Draw achievements from recent maritime education research actively. (d) Use the successful experience of other countries for reference. (e) Train personnel of different level and different standards with distinctive characteristics in accordance with the requirements of certain conventions and regulations home and abroad and the needs of the shipping market.

## **2 REQUIREMENTS FOR COMPETENT SEAFARERS**

### **2.1 REQUIREMENTS FOR THE SHIPPING INDUSTRY**

As maritime education is a part of the engineering education, personnel cultivation should conform to the general requirements of the engineering personnel, but it should also have its own characteristics, which lies mainly in the aspects of applicability, practicality, internationality and priority to management, etc. This characteristic determines that personnel of this kind should possess strong practical working ability, wide range of knowledge, high foreign language level, certain managing administrating and organizing ability. Personnel cultivating plan should be made up on the basis of personnel model requirements.

We have carried out large-scale investigation and research on the quality of personnel cultivation. From the fed-back opinion of the employers, main suggestions on the training of competent seafarers in the maritime education in China are:

- 1) Widen professional range, strengthen infiltration among disciplines, and set up new optional courses such as economics, law and management.
- 2) Increase the reform force on teaching contents. Follow closely the tracks of nautical science and technology and introduce new knowledge and new technology into maritime education in time, especially increase the force on teaching material construction.
- 3) Develop closer relations between the university and the employers. The

university should keep abreast of current needs of the enterprise timely and revise syllabus promptly.

### **2.2 REQUIREMENTS OF STCW 95 FOR SEAFARERS**

Compared with the STCW 78, the principle mark of the modification of the STCW 95 is the Functional Approach, Evaluation of Competence and Compliance and Verification Mechanism, which embodies the change of the demands of the seafarers. It emphasizes the practice ability more than the speaking and writing abilities. Therefore, the universities have to make modifications in teaching contents, teaching method and examining method in order to meet the requirements. The following aspects should be considered:

#### ORIENTATION OF THE EDUCATIONAL SYSTEM AND TRAINING AIMS

The annex of STCW95 provides functions at different level. However, the running educational systems, though provides the 4-year university education and all the knowledge of managements, provides insufficient sea-going service, which results in the failure of the mastery of the actual ability at the management level demanded. This fact should be orientated scientifically. Moreover, will the theoretical management knowledge, which has been instilled into the cadets during the 4 years education, be out of date when they come to the management level? Do they need to reenter the universities to renew their knowledge and be retrained? These questions require clear understanding. A matters stand, the pre-promotion training for the 4-year graduates contains more reviewing than renewing knowledge.

#### THE MINIMUM REQUIREMENTS AND THE SUGGESTIVE REQUIREMENTS

According to the annex of STCW95, the requirements are divided into two parts. Part A are mandatory standards and requirements. Part B are not mandatory but recommended guidance. Therefore, the course design should at least meet the requirements in Part A, and the teaching content and teaching hours should also follow the model courses. However, should the quality of the seafarers trained be

higher than the requirements in part A, and to what extent? This should be fixed. At least, the regular college course should consider the concerned contents of the recommended guidance in Part B on the basis of Part A.

ENGLISH ABILITIES. STCW makes some requirements on the seafarers' English abilities, but the length of teaching hours hasn't been fixed because of the difference between the English-speaking countries and non-English speaking countries. As English ability is one the main obstacles in international competition, English teaching contents and time should be seriously studied.

SPECIAL TRAINING REQUIREMENTS FOR PERSONNEL ON CERTAIN TYPES OF SHIPS Besides container ship, bulk carrier, oil tanker, there are LNG or LPG, ro-ro ships and passenger ships, upon which STCW has its stipulations and special requirements. The resolution of the Convention also deals with the requirement concerning the training of pilots, VTS personnel, and personnel on mobile offshore equipment. Obviously, it is unrealistic and not economical to bring all the requirements into training programs, but these ships and trades exists objectively, and there are always a number of graduates to work in these fields. Therefore, there should be special means to plan training programs.

### **3. THE ENVISION ON THE KNOWLEDGE, CAPABILITY, QUALITY STRUCTURE AND CULTIVATION PATTERNS OF SEAFARERS IN CHINA**

#### **3.1 KNOWLEDGE, CAPABILITY, QUALITY STRUCTURE OF SEAFARERS**

Marine navigation is a special one--- the working condition extremely hard and working environment complicated and capricious. During navigation the seamen should have not only the perfect expertise and strong physique, but also the aptitude to adapt to the environment; good psychological quality and the ability to solve various unpredictable problems with promptness, resolution and independence.

#### **3.2 THE CULTIVATION PATTERN**

##### THE BASIC GOAL OF CULTIVATION

Morality, intelligence and physique are to be developed together; knowledge, capability and quality are to be improved congruously. According to international and domestic related statutes, the personnel are trained to own comprehensive quality, strong consciousness of safety and environmental protection and international competitive ability.

##### THE BASIC PATTERN OF CULTIVATION

For 4-year undergraduates, we practice fundamental knowledge solid, the horizon of knowledge wide and practical ability excellent corresponding with the regulatory basic requests in STCW78/95. For 3-year cadets, we practice strengthen professional knowledge and operational ability corresponding with the operational basic request in STCW 78/95. For part of excellent cadets, we practice undergraduate-master-doctor chain cultivation to strengthen disciplinary construction, teaching faculty construction and training tip-notch nautical experts. For part of cadets we practice the comprehensive general-purpose training (navigation and engineering together) to fit with the needs of future development of shipping industry. And for the cadets with high level of English, we practice strengthening English training to suit the needs of international seafarer's market.

#### **3.3 THE WAYS OF QUALITY TRAINING**

(a) Strengthen the cadets' moral education and try to foster cadets with ambition, knowledge, morality and discipline. (b) Strengthen the cadets' self-regulatory ability and improve the cadets' ability to work independently. (c) Deepen the teaching reform, reinforce the teaching work. Revise completely the syllabus, and improve the teaching content. The syllabus should be made on the principle of facing the market, guaranteeing the basis; strengthen the quality education, associating closely with the STCW 95, distinguishing levels, and classified training. After the revision of the syllabus, we should revise carefully the teaching program for specialized course in association with the complication of overall teaching materials. Adopt strong measures in reforming the teaching methods and teaching medium. We should improve the cadets' self-learning ability and give cadets more room to think in the course of teaching. We should put more emphasis on the practice at sea and skill

training and make sure that the cadets can get band 4 certificate in English and certificate in computer application. (d) Stress the importance of attitude towards study, develop actively the extracurricular academic and technology activities. On one hand we should reinforce the moral education, on the other hand we should educate the cadets to increase the competitive consciousness, to adapt to the needs of society. (e) Reinforce the campus culture structure and improve the cadets' cultural quality. Improve the cadets' ability in many respects through the activity of speech, discussion, sports meeting etc. Establish all kinds of students' club and carry out activities regularly. Make full use of the weekend to hold all kinds of lectures and subsidiary courses. Make some of the cultural quality course and stipulate clearly that the cadets should choose some cultural quality course. (f) Reinforce the social practice education. Make the cadets understand the society, serve the society and strengthen their responsibility for society and increase their ability by organizing them to participate in the social practice. (g) Reinforce the psychological education. Open the psychological course to the whole students. Cultivate the cadets' spirit of fearlessness and progress forward in face of difficulties through the organization of extracurricular activities and counter-frustration education. (h) Bring into play the role of training persons and try best to form the good training atmosphere.

#### **4. TENTATIVE PLAN ON THE CULTIVATION OBJECTIVE AND COMPETENCE STANDARDS**

##### **4.1 PRESENT CULTIVATING OBJECTIVES AND COMPETENCE STANDARDS**

The present training objective of maritime education generally focuses on training high-level seafarers who will meet the needs of Chinese modernization construction and develop their morality, intelligence and physique roundly, and accept the basic engineering training. Such seafarers are consonant with STCW competent in international shipping market.

The main difference between training standard of undergraduate cadets and that of students in training schools lies in that education in university aims at training of qualified second officers and third engineers

on precondition of satisfying the degree education, and the education in training schools concentrates on practical seafarers who are supposed to be competent as third officers and fourth engineers. On the premises of achieving the requirement for certification by the maritime bureau, some colleges and universities request higher standards for their students. The higher standards are embodied in the systematic course and training and the teaching content. For example, the knowledge necessary for masters and chief officers has been included in the teaching plan in addition to the basic course and training.

##### **4.2 IDEAS ON THE CULTIVATION AIMS AND QUALIFICATIONS OF PRESENT HIGHER MARITIME EDUCATION IN CHINA**

Firstly, the maritime education demands that the graduates have to satisfy the requirements of STCW95 and the standard of national maritime bureau. Secondly, because maritime education is common engineering education, the graduates have to satisfy the requirements degree education. Since the last 40 years, the maritime education has trained many specialized personnel for the shipping industry. With the development of the opening up to the world and reform and the completion of the market economy, the standards for the society to assess the seafarers and the requirements will change. Some theories, which were taken reasonable in the traditional maritime education style, will be reconsidered and redeemed. (a) Traditional technical education will be shifted to comprehensive quality education. Generally speaking, traditional maritime education emphasizes technical education. And this style of intellectual training is not fit for the requirements of modernization construction. With the joining with the international shipping management of national ones, it requires that the quality of ship crews be raised, For the seafarers, they should strictly discipline their deport and show their good career morals, spirit of respect to job and comprehensive qualities. (b) The influence of curriculum and teaching content on cultivation aims. The construction of curriculum system and the determination of teaching content should be orientated to heighten the comprehensive qualities of the cadets. The school should underlie quality education of cadets in four aspects; e.g. moral quality,

vocational quality, cultural quality and physical quality. Whether the cadets are trained to meet the requirements of the cultivation aims is greatly concerned with constructing of curriculum and the determination of teaching content, so their importance should be realized.

#### **4.3 THE INFLUENCE OF STCW 95 TO THE CULTIVATION PURPOSE OF MARITIME EDUCATION AND THE PATTERN OF PERSONNEL**

At present, the higher education in engineering in China is the start phase of comprehensive reform and the new STCW is beginning to take effect. This is a historic opportunity to the reform in maritime education. The influence of the STCW 95 to the cultivation purpose of maritime education and the pattern of cadets mainly focuses on reconstructing the cultivating mode of specialized cadets in maritime education. Based on the traditional education which concentrate on technology, develop cadets: (a) abilities in many fields and the consciousness including leading ability, recourse ability, ability of using foreign languages, the consciousness of managing and operating and the consciousness of environment; (b) comprehensive quality, including technical quality and non-technical ability.

#### **4.4 SOME PROBLEMS ON ESTABLISHING CULTIVATING PURPOSE IN MARITIME EDUCATION AND THE PATTERN OF PERSONNEL**

THE NATURE OF MARITIME EDUCATION We think that maritime education is a organic combination of higher education in engineering field and higher education in occupation, that is, maritime education is based on higher education in engineering, it has an outstanding feature of higher education in occupation, because the main courses in maritime education are among the few courses which are set for work. In the course arranging system, we should be in the frame of higher education in engineering and highlight the features of higher education in occupation which is in the contents of education. To be specially, the syllabus of basic courses in maritime education and main courses in them should meet the requirement of higher education in engineering. The syllabus of professional courses should be consonant and

should adapt standards of Chinese seafarers and the requirements of STCW. We should think more from the higher education in occupation.

MODELS ARE DETERMINED WITH THE IDEA OF LIFE-LONG EDUCATION. Higher maritime education should adopt the idea of life-long education, because nautical techniques cover such spheres as economy, commerce, environment, so both STCW and competent authorities require that the seafarers should take compulsory training to refresh their knowledge. These requirements accord both to the scientific training path, namely studying-prctice-restudy-repracctce, and to the idea of life-long education. In the practice of maritime education reform, the maritime education field should rationally define the relationship between the quality of nautical special intellectuals and curriculum system and teaching content. What course should be completed for the bachelor's degree in four years? What in higher education, and what in compulsory training should be thoroughly considered at the angle of life-long education so as to allocate teaching hours reasonably. The curriculum content should be scientifically adjusted rather than simply adding to and deleting.

RELATIONSHIP BETWEEN TRAINING AIMS AND QUALITY EDUCATION The main training aims of higher maritime education should show the structure of the modern advance engineering education, including humanities and society quality, major and vocational quality and moral quality. And major and vocation quality is called technical quality while are classified into non-tech quality.

#### **4.5 ADVICE OR SUGGESTIONS**

CULTIVATION AIMS OF MARITIME EDUCATION. To train qualified seafarers with good moral, intelligence, health, and with comprehensive knowledge and ability, who has acquired the basic training in engineering, satisfying the international and national requirements for standards of competence.

TYPES OF PERSONNEL The types of maritime personnel should be classified and taught accordingly. For most cadets, they should be trained as qualified personnel in marine transportation. Some top cadets can be

offered better chance for self-improvement and then engaged in maritime education or research. Some who are interested in shipping management can be trained as personnel working both ashore and aboard by taking such courses as management, law.

## 5. A STUDY OF SYLLABUS AND ACADEMIC STRUCTURE FOR MARITIME EDUCATION

### 5.1 A STUDY OF SYLLABUS AND ACADEMIC STRUCTURE FOR NAVIGATION EDUCATION (students for bachelor degree in four years study)

With a thorough analysis of the navigation education both at home and abroad, considering its past, present and future trend, we carry out reformation in its application. We never cease but adjusting our reformation project for the syllabus and academic system in this field with the purpose that, we may cultivate successors in navigation: those required by the national and international regulations, qualified to our educational policy; those with comprehensive qualities, acute sense of security and environmental protection as well as competency in international competition.

1) As is mentioned above, we set our purpose

in fostering navigation specialty on the following criteria: accomplishing the basic training as an engineer; being a skill conductor of modern ships and a manager as well. A part from those criteria, we also set nine extra requirements in morality, intelligence, physical and other specialized functions respectively.

2) General adjustment and improvement. Guided by the national educational regulation, considering the needs of the new century for navigation successors, we redoubled our effort especially in the general improvement for the nautical specialized courses, as is shown in the following table. The reason for this adjustment is to strengthen their basic knowledge commands and widen their scope of knowledge. In their four years of academic study, the average school hour for the required theoretical courses is 20.0 (hours) every week, that figure will increase up to 22.2 when taking optional theoretical courses into account. The purpose is to permit out students more time for their self-study so that they can widen their scope of knowledge which is indispensable to cope with the future need of the society.

Table 1 course arrangement

| items course        | Number of course | School hours | Percentage in required theoretical courses | Percentage in total school hours |
|---------------------|------------------|--------------|--------------------------------------------|----------------------------------|
| Basic course        | 12               | 1150         | 53.24                                      | 47.92                            |
| supporting course   | 6                | 276          | 12.78                                      | 11.50                            |
| Professional course | 14               | 734          | 33.98                                      | 30.58                            |
| Optional course     | 33               | 240          | /                                          | 10.00                            |
| Total               | 65               | 2400         | 100                                        | 100                              |

## 5.2 COURSE ARRANGEMENT

STRENGTHENING CULTURAL KNOWLEDGE EDUCATION According to the requirement of the Ministry of Education ((MOE) that science students should stress on cultural education, moral education, health education, and other compulsive courses and music, fine arts, literature, history, discourse, eloquence, nautical psychology and other

optional as well as some certain social investigations are offered here.

STRENGTHENING ENGLISH LEVEL English level of the cadets would, to some extent, reflect their capacity in international competition. Therefore, the school hours of English course is considerably increased, which is up to 550. And the percentage of English teaching to the total theoretical

teaching is also increased to 25.5% (from its original 18.8 %). With the extra 70 hours for English as optional course, the total number can be counted up to 620 hours. So we can guarantee a four-year continuous English instruction. Among those extra hours, we offer listening comprehension and oral class especially, together with advanced reading, and audio-visual class. The satisfactory result is that we've reinforced listening comprehension reading drill. To ensure the realization of desired goal, the cadets are stipulated to take band 4 CET (College English Test), on which basis they are still demanded to pass Band Two oral English Test regulated by the Ministry of Communications.

STRENGTHENING THE COMPUTER APPLICATION LEVEL Considering that navigation, communication, shipping transport and management are progressing moving under the computer operation system, the content and class hours of the computer course undergo a great adjustment to meet the demand of modern shipping. Computer course periods are raised from former 100 to 130 hours, the proportion of which has been added up to 6.0% from 3.6% against all the theoretical teaching periods. The elective computer practice course included, the entire computer course can amount to 190.

INTENSIFY THE PRACTICE LINK Together with the 26-week on board practice, the navigation training course periods is added to 7 weeks from former 5 weeks to guarantee the achievement of STCW 95. What's more, in addition to the radar plotting and ARPA training, bridge simulator training is added, which occupies 2 weeks' class hours.

OPTIMIZE THE STRUCTURE OF PROFESSIONAL COURSES Bases on our country's present level and the international requirement, the course structure and content of the professional courses and the fundamental courses undergo macro adjustment. According to the requirements of the maritime bureau, deck officers must obtain GMDSS operator certificate. Therefore, GMDSS practical training course is added up to 3 weeks (former 1 week). In order to offer the cadets more time of operation practice,

GMDSS course is taught in two terms concerning ground station equipment and satellite section respectively. The periods of the traditional navigation courses are generally reduced by about 10%. The former courses such as nautical astronomy, marine navigation and navigational mathematics are combined into one new marine navigation course, which is reduced to 140 from former 210 hours. Two courses, ship-handling and watch-keeping and collision avoidance, are combined into one course, the periods of which is reduced by 10 %. Ship principles and cargo-work are properly combined the teaching hours is increased to 80. Electronic and radio navigation equipment also undergo corresponding adjustment and the periods is reduced from 90 to 60 hours. Ship Operation and Management and the Introduction to International Conventions are two newly set ones to enlarge the cadets' knowledge on ship operation, convention, and law.

THE SET OF OPTIONAL COURSES To widen student's knowledge and foster adaptable personnel, we promote the proportion of optional courses, that is, at least 240 hours of optional courses must be completed, and it is also regulated that the courses restricted to select must be finished no less than 120 hours.

Comparison of teaching hours between the old and the new curriculum. In order to make it easier to illustrate the reformation of our research program, we show the 3 following tables to give a brief demonstration.

Table 2 shows that a higher proportion of optional subjects is made in the new teaching program, and the proportion of the major subjects is appropriately raised, which is mainly caused by broadening the knowledge span of the major subjects.

Table 3 shows that compared to the old teaching program, practical activity, English and computer teaching hours are ensured.

Table 4 shows that in the major subjects, some contents concerned with the rules and management are added, which reflects the practical condition and need of the market.

Table 2 Theoretical teaching statistics

| Item<br>subject       | 93 Teaching program |             |                 | 98 teaching program |             |             | This teaching program |             |             |
|-----------------------|---------------------|-------------|-----------------|---------------------|-------------|-------------|-----------------------|-------------|-------------|
|                       | Number Of           | Total hours | Pro-Portion (%) | Number Of subjects  | Total Hours | Pro-portion | Number Of subject     | Total hours | Pro-portion |
| Public basic subjects | 15                  | 1450        | 51.8%           | 12                  | 1298        | 52%         | 12                    | 1150        | 47.9%       |
| supporting subjects   | 6                   | 320         | 11.4            | 6                   | 284         | 11.3%       | 6                     | 276         | 11.5%       |
| professional subjects | 13                  | 808         | 28.9%           | 12                  | 716         | 28.7%       | 14                    | 734         | 30.6%       |
| Optional subjects     | /                   | 220         | 7.9%            | /                   | 200         | 8%          | /                     | 240         | 10%         |
| total                 | 34                  | 2798        | 100%            | 30                  | 2498        | 100%        | 30                    | 2400        | 100%        |

Table 3 Main subjects statistics

| item                                                              | 93 teaching program | 98 teaching program | This teaching program |
|-------------------------------------------------------------------|---------------------|---------------------|-----------------------|
| Theoretical teaching hours                                        | 2798                | 2498                | 2160                  |
| Practical teaching hours                                          | 56*30               | 50*30               | 54*30                 |
| Proportion of practical teaching in the total teaching hours      | 37.5%               | 37.5%               | 42.9%                 |
| English teaching hours                                            | 380+126             | 514+94              | 440+10                |
| Proportion of English teaching in the theoretical teaching hours  | 18.1%               | 24.3%               | 25.5%                 |
| Computer teaching hours                                           | 100                 | 130                 | 130                   |
| Proportion of computer teaching in the theoretical teaching hours | 3.6%                | 5.2%                | 6%                    |
| Total teaching hours                                              | 4478                | 3998                | 3780                  |

Table 4 The corresponding relationship between the subjects in the teaching program and STCW 78/95 function models

|                                     |                                                                         |
|-------------------------------------|-------------------------------------------------------------------------|
| Navigational function               | Marine navigation (130 hours) + passage plan (1 week)                   |
|                                     | Navigational watch, ship maneuvering and collision avoidance (72 hours) |
|                                     | Navigational aids (50 hours)                                            |
|                                     | Nautical meteorology and oceanography (54 hours)                        |
|                                     | Marine radar and ARPA (44hours)                                         |
|                                     | Marine signals and VHF communication (20 hours)                         |
| Cargo handling and stowage function | Cargo handling (80 hours) + stowage plan (1 week)                       |
|                                     | The safety management of the ship (20 hours)                            |
|                                     | Ocean shipping practice and maritime law (72 hours)                     |
|                                     | Introduction to International conventions (30 hours)                    |



|                                                             |                                                      |
|-------------------------------------------------------------|------------------------------------------------------|
|                                                             | Ship's operation and management (40 hours)           |
| Ship operation Management and personnel management function | The safety management of the ship (20 hours)         |
|                                                             | Ship construction and ship design (40 hours)         |
|                                                             | Ocean shipping practice and maritime law (72 hours)  |
|                                                             | Ship's operation and management (40 hours)           |
|                                                             | Introduction to International conventions (30 hours) |
| Radio communication function                                | GMDSS Communication equipment (30 hours)             |
|                                                             | GMESS communication practice (20 hours)              |
|                                                             | Marine signals and VHF communication (20 hours)      |

### 5.3 THE STUDY IN THE REFORMATION OF TEACHING PROGRAM AND COURSE STRUCTURE OF MARINE ENGINEERING

We make the guiding ideology about the reformation program of the higher education of 21<sup>st</sup> century as our starting point. We analyze earnestly about the features of the maritime education and the training objective. And we put forward the teaching program of marine engineering and the program of course structure reformation in the service of the training objective.

#### 1) THE GENERAL IDEA ON TEACHING PROGRAM AND THE REFORMATION OF THE COURSE STRUCTURE.

We consider fully of the specialty structure and feature to optimize the course structure. We take the newest achievements of the advance of science and technology and social development to enrich and renew the teaching contents and teaching method. We establish the idea of life-long education and make cadets get a good theory basis in school to create conditions of continuous education in the future.

#### 2) OPTIMIZATION OF SYLLABUS.

In order to realize the cultivating aims, we make sure the public fundamental courses 1150 hours, and then adjust the proportion of different subjects to optimize former syllabus.

Table 5 The comparison of the course arrangement and hour arrangement

| Course classification                     |                     | Class hour  | Percentage in total course (2925) |
|-------------------------------------------|---------------------|-------------|-----------------------------------|
| Required courses                          | Moral education     | 60 (90)     | 2.4 (3.1)                         |
|                                           | Military theory     | 18 (60)     | 0.7 (2)                           |
|                                           | humanities          | 120 (160)   | 4.7 (5.5)                         |
|                                           | English             | 440 (365)   | 17.2 (12.4)                       |
|                                           | P.E.                | 120 (120)   | 4.7 (4)                           |
|                                           | Fundamental courses | 1150 (520)  | 44.9 (38.4)                       |
|                                           | supporting courses  | 634 (720)   | 25.8 (31)                         |
|                                           | professional course | 536 (69)    | 21.8 (23.6)                       |
| The total class hours of required courses |                     | 2320 (2725) | 92 (93)                           |
| Limited optional class hours              |                     | 120         | 4.8                               |
| Free optional class hours                 |                     | 80 (200)    | 4.7 (7.0)                         |
| Total theoretical teaching hours          |                     | 2460 (2925) | /                                 |
| The weeks of practice                     |                     | 52 48       | /                                 |

(a) Reduce the total teaching hours and stress competence education. In the new syllabus, the total teaching hours of the required and optional courses are restricted to 2,560, which are 405 less than it used to be. The required courses total 2,320 hours. The theoretical courses are 20 or so on the average every week, so that the cadets could improve their all-round capability. Meanwhile, the courses, such as humanities, economics and management, law, and anti-pollution laws and regulations, have been selected as optional ones.

(b) Emphasis on the training of the application in English. In order to gain some competitive advantage in the international shipping market, the cadets must be good at listening, speaking, reading and writing in English. The teaching hours for English are increased greatly. Those of required courses are increased from 365 to 440 in addition to 96 of professional English. The total hours cover almost 1/5 of the planned ones. 120 optional hours of reading and spoken English are also arranged to ensure the four years of English study.

(c) Stress practice. The specialty of marine engineering is characterized in all-round competences, especially the one in practice. Thus, in the new syllabus, the hours for practice are increased from 48 weeks to 52 weeks. Improvements are also made to meet the practical and gas welding are increased from 2 weeks to 4 weeks. The assembly and disassembly of the auxiliary engine is also added to the practice. In addition, more superior engineer-electrician seafarers are wanted in the international shipping market. Therefore, the new syllabus stresses much training, adding more teaching hours to the course of electricity. During practice, electric technology and the operation of ship power plant are also taught.

(d) Fulfill the STCW 95 completely and comply with the rules about seafarers' training, testing, and certification. It is the first prerequisite that the graduates should be in conformity with the STCW requirements so as to take part in the

competition in the international market. From this perspective, the reforms in higher nautical education must be carried out in accordance with the STCW 95. In the new teaching plan, we have set up correspondingly courses and teaching hours to meet the requirements of the test and assessment.

(e) Arrange the teaching scientifically and improve teaching quality completely. There used to be some insufficiencies in arrangement. For instance, the field practice for metal material technology was arranged in the fifth term, when the marine engineering material has not been ended yet. Therefore, this arrangement had a disadvantageous effect on study. Furthermore, it was a long time since the practice started. So it also affects the training of practical operation. The training of simulators and comprehensive experiments should be arranged as an all-round training after the professional courses have been studied. But we used to arrange them in the same term, and it inevitably affects the result of practice. Because of the above-mentioned problems, the syllabus has been modified reasonably.

### 3) THE OPTIMIZATION OF THE COURSE STRUCTURE

The optimization of course structure is the basic guarantee of realizing the basic aims of teaching program. The course structure is designed with the aim of strengthening the basic knowledge, broadening academic coverage, emphasizing diathesis education and enhancing the competition in the international seafarers' market. The coordination of repetition on content, deletion of backward content and absorbing of up-to-date science and technology achievement and developing trend in the related discipline are required.

#### THE EMPHASIS OF BASIC THEORIES.

Now we have designed 1784 hours on basic course, which is increased 2% and covered 76.9% of the total class hours, though 251 absolute class hours have been reduced. By this way, we took the full consideration of solid fundamental theory and basic knowledge for further education. Simultaneously, we also

took consideration of oral and reading of specialized English. Additionally, the alteration in course design makes cadets' knowledge structure more reasonable: the addition of basic course of computer application, the change from metal materials to marine engineering materials, the combination of maritime law and ship administration.

THE EMPHASIS ON COMPREHENSIVE CAPABILITY EDUCATION. The humanities courses and economic management courses which cover 4.7% of the total schooling periods are designed in the new syllabus which includes literature, music, fine arts, history, psychology and international conventions, etc.

The reform and practice in cultivation pattern and course system for maritime education is expected to cultivate high quality personnel equipped with the ability in international competition on maritime technology.