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Importance of Mechatronics in Maritime Education

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Abstract

Education and training of technical staff for the new generation technological equipment has a vital importance for developing countries in order to maintain sustainable development and keep up with new generation technologies. Mechatronics the synergistic combination of mechanical, electronic and software engineering from an engineering perspective to serve the purposes of controlling advanced hybrid systems is a product of new generation technology which can be given as a sample to this phenomenon. Recent marine engines are combination of heavy industry with high technology. Nowadays, ships are built in full automation and equipped with computer controlled mechatronics systems. However, finding qualified officer and engineers who can operate, maintain, control and repair when it is required such full automatic systems with knowledge of a new generation system became a serious issue. Due to importance of this fact STCW Manila amendment has new training and certification requirements for electro-technical officers. In this paper, Mechatronics applications on ship are introduced, importance of it highlighted and a new syllabus is proposed for the training of marine engineers to be nurtured with mechatronics knowledge as it is required.

KEY WORDS : Marine Engines, Ship Automation, Mechatronics Education, Robotics

1. Introduction

Mechatronics is a new discipline which is used for industrial design and manufacturing based on not only two classical engineering disciplines, machinery and electronic but also computer science and software engineering. It is an interdisciplinary branch of engineering concerned with designing of products functions based on integration of mechanical, electronic, computer and software technology and used to establish improved products, processes and systems. [1]

Mechatronics design is aimed to optimize design related solutions from two point of view by simultaneous design of mechanic and control system. With this method, machine and system design is considered as a whole at the initial stage. It provides contribution of all for optimum solution by creating opportunity for positive influences of mechanical system on control system or vice versa upon situation. The automatic machines produced in a mechatronics approach can perceive, process the decision, make decision and proceed based on this decision (means mechatronic systems), are utilized as fundamental device of modern automation technology in many industries such as medicine, agriculture, banking, mining, industrial manufacturing, defense, aviation, maritime.

2. Historical development of Mechatronic

Mechatronics term is originated from Japan, combination of the "mechanic and electronic" words in a fitting way. Mechatronics is a new branch of science based on machinery, electronics, and software and control systems technologies. Mechatronics engineer are called as who work on this subject. Mechatronics system used for the first time at the end of the 1960s by an engineer who works for Yaskawa Electric Company in Japan to provide control of electric motors by computers. This concept has spread from Japan and accepted by the time all over the world. Bachelor and master programs are

offered in the universities after increasing applications of the mechatronics in the world. In 1970s, Mechatronics systems are mostly used in the products of servo technology such as automatic door openers, auto-focus cameras etc. In 1980s, by the introduction of information technology, engineers began to use it together with microprocessors to improve the performance of mechanical systems. Numerically controlled machines and robots, even more widespread and electronic engine control and ABS brake systems used in the automotive industry as their implementation. And in 1990s, information technology is participated to this mixture of technology and connection of production lines to large networks took place. Thus, it is enabled remote-controlled operation of the robotic systems. At the same time, the smaller sensor and control technologies are increasingly being used in new products. Micro-electromechanical systems such as tiny silicon acceleration sensors used to control opening of automobiles airbags, recently introduced [2].

3.Mecathronics Systems

The mechatronics, alone is not a branch of engineering as it is implied in Figure 1. So, it is the extension of more than one disciplinaries in a common ground. In this sense, mechatronic systems reveals the necessity of interdisciplinary collaboration between engineering branchs. A mechatronics engineer should have profound knowledge not only about the mechanics, but also electronic (electromechanical, sensors), software (system modeling, simulation) and control (control circuits, digital control, and microcontroller) systems. Moreover, he or she should be capable of handling those disciplines. Intelligent robots, devices work with artificial intelligence and even homes appliances, such as washing machines, dish washers are also an implementation of mechatronic systems [3]. The development of mechatronic systems prepares ground for some important implementation such as advanced medical devices, house robots, sequential automation, Security systems, and the realization of remote-controlled space studies

4.ITU Maritime Faculty and Mechatronics Education

Mechatronics is an important technologhy for the marine industry as well. Recently builded ships are furnished with high-tech advanced systems such as full automation, digital control, electropneumatic. Marine engineers who recently graduated or has been educated by classic marine engineering, have to learn sophisticated mechatronics system either by personal endevaour nor by trial and error method. Young engineers who boarded on ship by lack of knowledge of mechatronics literally live a technology shock. It is important for engineers that their knowledge and education updated with today's technologies to understand, apply, operate and utilize for developments. Universities continuously-closely monitor present and future technologies in accordance with visions and missions and have to update –developed new syllabus to respond to these technologies and foster self-confident, contemporary, innovative, competitive and spirited young researchers/ engineers. Similarly, it is important for marine engineering educating institutions that the theoretical and practical training of mechatronics take adequately part in the syllabus as much as needed.

5.Conclusion

Institutions or organizations foster seafarer engineers should be in cooperation with industry to meet need of qualified personnel and their training. In addition, it should be one of the main objectives of educational institution to provide opportunity for training of seafarers and self-development against the continously emerging technologies by the slogan of continuious education, lifelong education.Mechatronics is a technology that today's marine engineers have to catch up. Therefore, maritime faculty and colleges who foster marine engineers should make necessary revision on their syllabus. Main subjects such as mechanical, hydraulic,

pneumatic, electric-electronic technologies should be mandatory and subjects given in Table 1 should be in the syllabus.

Table 1 Recommended mechatronics Subjects

Recommended Subjects	Credit	Hour	Appl.	Lab
Fundamentals of Mechatronics Engineering	**1**	1	0	0
Signals and Mechatronics Systems	**3**	2	2	0
Mechatronic Components	**3**	2	2	0
Mechatronic Design I, II	**3**	1	4	0
Mechatronic Instrumentation	**3**	1	4	0
Intelligent Mechatronics	**3**	3	0	0

Besides of improvement in syllabus, practicing has crucial role in mechatronic education. Therefore, appropriate laboratory environment should be provided and let students practices and improve their skills. The students must earn experience by project-based studies and learn teamwork, cooperation, development of learning ability, gain confidence and social skills. In addition to these, students should develop abilities to utilize different technologies (sensor, PLC, measurement, communications, driver robot, transportation, assembly, technologies and quality assurance, commissioning, maintenance, optimization and diagnostics) in laboratory environment. For this purpose, MPS (Modular Production System) units can be used in laboratories.

Referances

[1] http://www.sau.edu.tr

[2] http://vikipedia.com

[3] Çetinel, M., Mühendis ve Makine Dergisi, Ekim 2000, sayı:489, cilt:41, sayfa:29-31.

[4] Gören, A., Başer, Ö., Mühendis ve Makine Dergisi, ..., sayı:589, cilt:50, sayfa:49-58.

[5] Yenitepe, R., "Mekatronik Eğitiminde MPS Üniteleri", The Turkish Online Journal of Educational Technology (TOJET), October 2004, V:3 (4).

[6] MMO, "Hidrolik-Pnömatik Sektör Sorunları Tartışıldı", Tesisat Mühendisliği Dergisi, Kasım 2001, sayfa: 10-12.

[7] Platin, B.E., "Ülkemizdeki Mühendislik Fakültelerinde Hidrolik-Pnömatik-Kontrol-Mekatronik Eğitimi", II.Ulusal Hidrolik Pnömatik Kongresi ve Sergisi, İzmir, Kasım 2001, sayfa:27-35.

[8] TÜBİTAK Vizyon 2023 projesi, "Mekatronik Strateji Raporu", Mekatronik Strateji Grubu, Ağustos 2004, Ankara.

[9] http:// www.meb.gov.tr

[10] Rıza Gürbüz 2012, "Mekatronik Nedir Ve Türkiye'de Mekatronik Eğitimi" Proje Tabanlı Mekatronik Eğitimi Çalıştayı Mayıs 2012