

ITALIAN MARITIME CLUSTER AND GENOA UNIVERSITY: A COLLABORATIVE PARTNERSHIP FOR THE EDUCATION

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SUMMARY

The School of Naval Architecture and Marine Engineering in Genoa started its activity in 1870 as ‘Royal School of Naval Architecture and Marine Engineering’ with the aim to increase the scientific knowledge of ship designers and ship engineers for both the Italian Navy and the Italian merchant marine. At the moment the University of Genoa has two degrees of 5 years, and one PhD course in topics related to Naval Architecture and Marine Engineering. In this paper we discuss our experience of the so-called “Professionalising Seminars” in which various professionals, such as class surveyors, consultants, lawyers, brokers, claim managers, superintendents, technical managers and Coast Guard officers introduce their activities to the students, in particular about ship management, design and project management, safety and certification, the tasks of maritime authorities, fundamentals of maritime law, financing and insurance.

NOMENCLATURE

AIPAM Associazione Ingegneri e Periti di Avarie Marittime, is an association of independent experts in maritime casualties, founded in 1995 by a group of Naval Architects and Marine Engineers and headquartered in Genoa, Italy

ATENA Associazione Tecnica Navale, was founded in Genoa in 1948 by the board of Naval Architects and Marine Engineers, with the aim to promote maritime culture and disseminate the latest scientific and technical findings in naval engineering and offshore industries.

DITEN Dipartimento di Ingegneria Navale, Elettrica, Elettronica e delle Telecomunicazioni. It is the department within the University of Genova and its Polytechnic School focusing on Naval Architecture, Electronics and Telecommunications.

the economy of the town, and represented a cultural ‘continuation’ of the undergraduate Nautical School, that started its activity in Genoa in 1816.

The School was supported by the Genova Town Council, the local Chamber of Commerce and the Ministries of Industry and Agriculture and it was the first institution that offered a technical degree in Genoa.

The higher education in maritime topics was a necessity to boost the industrial activities in Genova that in XIX century were growing in parallel to the traditional port commercial activities. The aim of the School was to increase the scientific knowledge of ship designers and ship engineers for both the Italian Navy and the Italian merchant marine.

1. INTRODUCTION

1.1 GENOVA AND THE ROYAL SCHOOL

The town of Genova and the Liguria Region historically grown up around the maritime economy and lead the maritime culture in the Mediterranean. In XIX century, the development of steam propulsion for ships and the increasing international trade resulted in the need for higher education in technical fields. Two higher education Institutes were established in Genova: the Royal School of Naval Architecture and Marine Engineering (1870) and the Royal Institute for Economic Studies (1883).

The Royal School of Naval Architecture and Marine Engineering, since the beginning, was integrated in the cluster of traditional maritime activities that characterises

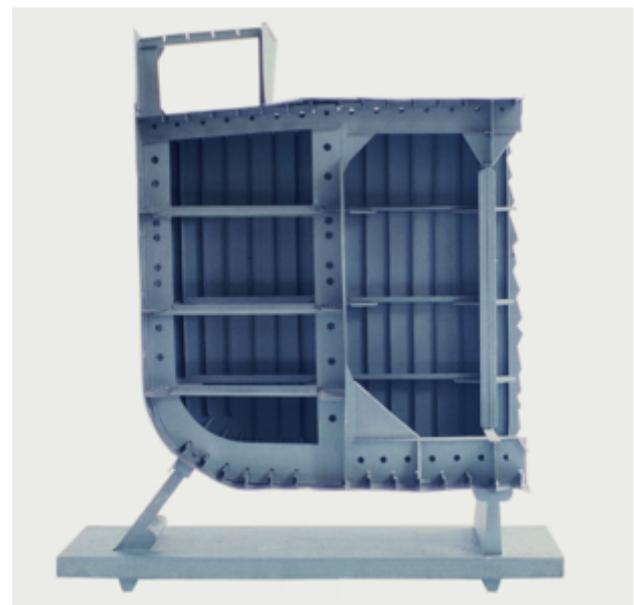


Figure 1: Didactical model of a transverse bulkhead

In 1933 the Royal School was aggregated to the University of Genova as Faculty of Engineering and located in the historic Villa Giustiniani Cambiaso in the district of Genova Albaro. [1]



Figure 2: Villa Giustiniani Cambiaso

1.2 THE POLYTECHNIC SCHOOL AND THE DEPARTMENT

Despite the evolution of names and organisation schemes, the School continued to be a pillar of the technical evolution of the maritime sector. The teaching and research topics, traditionally focussed on ships, since 1992 were increased including also topics related to small ships and pleasure crafts, a growing economic sector in the Liguria region. Such activities are managed in a dedicated university location in La Spezia.

After the recent re-organisation of 2010, the formerly Faculties of Engineering and of Architecture were merged into the new Polytechnic School, nowadays formed by five departments. Concurrently, new Departments were created and the Department of Electrical, Electronic, Telecommunication Engineering and Naval Architecture (DITEN) is now in charge for both research and teaching activity in the marine field.

According to the Italian and EU higher education legislation, the Polytechnic School has three levels of education:

- The 1st level comprises three-year courses in various branches of engineering and a final thesis. A completion of a three-year course awards the Bachelor Degree.
- The 2nd level comprises two-year courses in a particular engineering branch and a final thesis.

A completion of the two-year course awards the Master Degree.

- The 3rd level of degree offered by the School is the research degree (PhD) that has a programme of study of 3 years.



Figure 3: Laboratory facilities in the Department

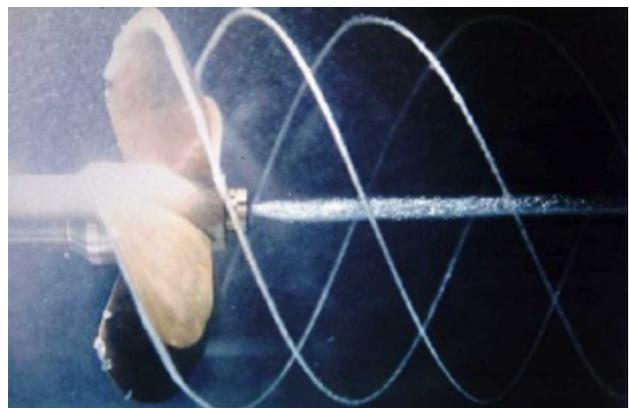


Figure 4: Test on propellers in the cavitation tunnel

At present the Polytechnic School offers the following degrees in topics related to Marine technology:

- Bachelor in Naval Architecture and Marine Engineering, Genoa;
- Master in Naval Architecture and Marine Engineering, Genoa;
- PhD in Naval Architecture and Marine Engineering, Genoa;
- Bachelor in Pleasure Craft Design, La Spezia;
- Master in Pleasure Craft Design, La Spezia;
- Bachelor in Naval Architecture and Marine Engineering, 4 years, Leghorn (only for Italian Navy staff).

The number of students per year in Marine Technology is about 550 in Genoa, 500 in La Spezia and 50 in Leghorn. Employment opportunities are facilitated by including the graduates' CVs in the AlmaLaurea database allowing European companies to identify suitable profiles at a European level.

2 NAVAL ARCHITECTURE AND MARINE ENGINEERING PROGRAMS

2.1 'LAUREA' (BSc) COURSE OBJECTIVES

The aim of Bachelor's Degree (3-year studies) is to provide professional education and training necessary to a Naval Architect and Marine Engineer. The course is aimed to supply the students a proper knowledge of general scientific subjects and methodologies as well as specific professional topics within the naval architecture and marine engineering field.

The offered subjects are oriented to basic engineering education and basic technical knowledge about naval architecture and marine engineering, giving the possibility of a further cultural development within the Master. Strong elements of computer aided design, manufacturing, industrial internships, contribute to form a professional skill able to promptly interact with the job environment.

Specific topics are grouped into the following main fields:

- Naval Architecture that deals with hydrostatics (hull geometry, buoyancy and stability) and hydrodynamics (ship resistance, propulsion and sea keeping);
- Ship Structures that studies the structural definition of the hull (loads, structural hull scantling and strength) and production methodologies;
- Ship Propulsion Plants and Services that encompasses the propulsion plant (engine, shaft lines, propulsors), the hull service plants and the ship specific and auxiliary plants.

2.2 'LAUREA MAGISTRALE' (MSc) COURSE OBJECTIVES

The first step in a Naval Architect's education and training (BSc) has its natural continuation in the Laurea Magistrale (MSc) in Naval Architecture and Marine Engineering. The aim of the post graduate level of this course programme is to focus on the scientific-theoretical aspects of engineering relevant to naval architecture and marine engineering. The graduates will be able to identify, model and solve, even in an innovative way, complex problems which require a multidisciplinary approach, in ship related topics.

Lessons are proposed and organised with the aim to provide for the competence to design, plan and manage systems, processes and complex or innovative services with a good knowledge of an European foreign language and business administration culture.

The Master Degree has a course schedule of 4 semesters and it requires a total effort of 120 ECTS.

Typical professional careers of postgraduates are those related of production innovation and development, advanced design and management, in private and public companies. Traditional employment sectors are shipyards, marine technology industries, design and consultant studios, ship management societies, classification societies, technical department of navy, research institutes.



Figure. 5: FEM mesh for a racking analysis

2.3 DOUBLE DEGREE 'LAUREA MAGISTRALE IN INGEGNERIA NAVALE' AND 'ADVANCED MECHANICAL ENGINEERING (MSc)'

Under the "Common Program awarding the Double Degree", students may attend the 1st year of the Master's Degree Program in Naval Architecture and Marine Engineering in Genoa, and the second year in Cranfield, UK, ending up with a double – Laurea Magistrale and Master of Science – degree.

The "Common Program awarding the Double Degree" is run under a "Double Degree Agreement" signed by both Universities. Applicants to the "Common Program awarding the Double Degree" will be selected from among the students of the Master's Degree program in Naval Architecture and Marine Engineering. Such selection takes place during the first semester of the first

year. Candidates, in addition to other requirements specified in the selection notice, shall meet the following criteria:

- Bachelor Degree score of minimum 100/110;
- English language proficiency (minimum 92 TOEFL score or equivalent)

Maximum 5 students can take part in this program every year. Students are partially funded by Erasmus+ EU programme and by the University of Genoa through Ollano legacy.

3. THE PROFESSIONAL SEMINARS

3.1 ORIGINS

The industry propelled the creation of a school for higher education in technical fields since the beginning, sponsoring the foundation of the Royal School. Thus, the relationship with the academic world has been always very strong.

This has been particularly true between shipping and maritime worlds and the Royal School before and then the Department of Naval Architecture and Marine Engineering. It has been always natural a passage from Navy/Merchant Marine/Shipyards to the University and vice versa. The participation of former students to the life of the University as lecturers has always been a standard.

However, since the '90s, this became more constant, in particular due to a strict cooperation with ATENA. ATENA members, being former managers of important shipyards, described to the students their experiences and what they were expected to do in the "outside world".



Figure 6: Logos of the promoters of the seminars

About a decade after, it was understood that the world was rapidly changing, the outsourcing was always more frequent and the role of the independent professional was therefore more prominent than in the past. AIPAM entered in the scene at that time and a number of its members sided the ATENA ones, with an approach more oriented to picture the scenario of the self-employed professional.

2004 was a pivotal year, as the structure of Italian Universities deeply changed and the concept of credits for the students was introduced. The credits were awarded for activities in cooperation with the industry and the lectures of ATENA and AIPAM members became a source of profitable interconnection.

Various professionals were contacted and the reply was nothing less than enthusiastic.

3.2 CURRENT SCHEME

The current scheme of the seminars consists of different modules, each one comprising one or more lectures of about 2 hours each.

The course is developed in two periods running through the 1st and 2nd semester of the academic year, so as to avoid periods when the students may have to deal with examinations.

At the end of the course, the students and some of the speakers are involved in an exercise, simulating one of the scenarios developed during the lectures.

The students who have attended the lectures are granted the appropriate academic formative credits and receive a certificate of attendance.

3.3 PROGRAMME

The complete course programme consists of the following modules:

Shipowning Management Fundamentals (3 lectures)

- The shipping business
- The decisions facing ship owners
- The fleets and the markets
- The technical ship management

Ship design and shipbuilding management (3 lectures)

- The ship industrial project
- Economic analysis of the project
- The world newbuilding market
- Newbuilding specification
- Newbuilding contract
- Factors influencing the cost of a ship
- Ship owner/Shipyard relations
- Design development
- Building development
- Ship delivery. Warranty
- Building defects

Ship management and SMS (1 lecture)

- SMS
- Functions of the personnel ashore and on board

Safety and certification (3 lectures)

- Class certification during design, building and ship operation
- The statutory requirements: Load Line, SOLAS, MARPOL, STCW
- Risk management

The Maritime Authorities' duties (2 lectures)

- The role of the Maritime Administration over harbours and ship' Master
- Port State Control
- ILO Maritime Labour Convention

Safety in the working areas (2 lectures)

- Safety in the working areas and responsibilities
- Use of IPD (Individual Protective Devices) on board
- Asbestos and bacteria
- Access to confined spaces
- Overhanging works
- Fire prevention
- Lifting devices

Maritime law (2 lectures)

- Legal definition of the ship owner
- Ship's Flag
- The legal framework applicable for a newbuilding contract: types, regulating bodies, jearchies
- Professional responsibilities of the engineer

Shipping economics (2 lectures)

- Business plan of a Company
- Evaluation of investments
- Financing the investments
- The contract for maritime financing

Casualties and underwriting (3 lectures)

- Roles and Responsibilities
- P&I, H&M and Cargo covers
- A case study



Figure 7: A case study discussed at the course

Chartering and ship brokerage (2 lectures)

- International charter market
- Chartering and economics
- Type of chartering contracts
- The market and its influence on design
- Offer/demand and their balance
- Time Charter clauses
- Obligations of parties

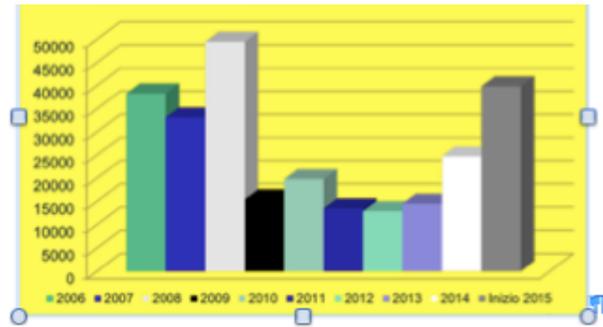


Figure 8: Daily charter rates of Aframax tankers 2006/2015 - Graphs discussed at the course

Vetting

- What is vetting and who requires it
- Consequences on the management
- Vetting procedures



Figure 9: Surveying (from speakers' presentations)

3.4 METHODS

The speakers are not professional lecturers and are in general quite reluctant to follow a traditional teaching scheme, referring to consolidated notions and highly reputed academic texts. On the contrary, the roots of the seminars are coming from the personal experiences and an ample spectrum of case studies is used.

This approach has the intrinsic risk of showing as universally valid examples which should be considered more particular. On the other hand, the students appear to be fascinated by the description of the real life and how the theory they are studying is put in practice.

Each module is construed in such a way to be complete and independent per-se, without any need of referring to other ones. This approach is deriving from the origin of the project and how it developed in the years, by adding new ideas and subjects as a consequence of a new professional, having different experience and interests, joining the team.

This is far from being detrimental to the quality of the seminar as a whole, because it gives to the students the immediate perception how their professional future might be varied and how they have to be ready to adapt their academic studies to a number of different scenarios.

Also, leaving the lecturer free to describe a subject in which he/she feels very comfortable, gives a great freshness to each module.

Animated presentations are widely used and it is often repeated to the students that they have not to consider the seminar as something “they have to study”, but something “they have to hear and feel”. No reports are distributed and ample time is given to questions and answers, where doubts and curiosities are clarified.

The lecturers are so willing to maintain vivid their presentation that it is not infrequent the case of someone reluctant to duplicate the module of the preceding year, fearing the boredom of repeating the same subject and forgetting that is the audience that is continuously changing, being composed by a new course of students.

The interactivity between lecturers and students is considered of paramount importance. Students are frequently involved in the lectures, to the point that sometimes a real case is described and some of them are asked to take the part of one of the stakeholders (class surveyors, owners’ superintendents, consultants, etc.) and describe to their colleagues how they would act. A professional usually having the same role in the real life is backing them, explaining pros-versus and limits of any decision.

The interactive and close-to-reality approach is confirmed by the final exercises, which usually require to the students to draft, with the assistance of the speakers, who are in this case acting as a sort of tutor, an outline newbuilding contract specification, an organization scheme and chart of a shipowning group or to prepare an executive summary of a casualty report.

4. THE SPEAKERS

4.1 LINKS

Since their very first beginning, the seminars held by DITEN were based on the contribution of professionals, which had been students in the same University. Those which did not have this background were however deeply linked with the same university.

The organization of the lectures was always carried out by activating a network of contacts, which dated back to the time when the perspective lecturers were students, or contacting other professionals that had been met in various circumstances and were considered for one reason or the other “suitable for the scope”.

This aspect is not to be underestimated, because it is a clear example of the most valuable tool the young student has to learn to use entering in the industry, which is networking.

It was a motto of prof. Marsich, for decades the iconic figure of the Naval Architecture department, that a good engineer has not to presume to know everything, but has to know where finding the proper answers. In the modern world, in which the specialization is more and more preminent, this suggestion is often to be mutated in the need of knowing the proper person, to which route the question, looking for a qualified and reliable reply.

The scenario given by the seminars, in which it is obvious the interconnection existing between the different speakers, and in some cases their professional rivalry, is in our opinion the first glance of the students to the real world in which they will have to move, where quite often knowing the right phone number will be more advantageous than solving a second-degree equation.

4.2 REMUNERATION

The activity of the lecturers if fully voluntary and no compensation of any type is given or is foreseen for the future. This is not due to budgetary restrictions, but to the intention of keeping the project on a level of a service given to the institution and to new generations of professionals by older and qualified colleagues, which are required to spend time in preparing their speeches and to reorganize their agenda to match with the needs of the School, despite many of them are in their fully active professional life.

Nevertheless, it has never been a problem finding the necessary number of people to complete a full programme. On the contrary, sometimes it has been necessary to renounce to a new proposed modules due to the lack of sufficient time in the schedule of the seminar.

This might be due to various reasons, from the emotional link maintained with the University, to the loyalty to the colleagues, which are running the project, to the pleasure of share personal experiences to young and often very clever and well prepared youngsters.

4.3 BACKGROUND AND CURRICULA

As mentioned before, most of the lecturers are naval architects and marine engineers, graduated in the same University of Genoa. By using their personal relationships, in the years they involved also colleagues and professionals also from different fields and having a different background.

Just using the seminar concluded in June 2015 as an example, the team of lecturers was composed by:

- M Bazzani, R Damonte, A Gnecco, G Mattarelli, A Panarello, all naval architects and marine engineers, having an aggregate experience and involvement in all the most recent accidents in Italian waters
- G Damilano, former manager of an IACS Classification Society
- B Dionisi, naval architect and marine engineer, former manager of a fleet of passenger ferries
- M Leveratto, naval architect and marine engineer, technical manager of a fleet of tankers
- E Menconi, Coast Guard commander, assistant to the Maritime Director of the Ligurian Sea
- E Navone, naval architect and marine engineer, financial director of a shipping company operating liner container ships
- S Galliano, naval architect and marine engineer, regional manager of an IACS class society
- R Giancola, naval architect and marine engineer, professional, independent expert
- E Palmesino, broker, awarded in 2011 by Lloyd's List for his activity in education and training
- F Piunti, naval architect and marine engineer, manager of a fleet of internal water ferries and passenger vessels.
- S Vaccari, maritime lawyer

They were preceded by a number of colleagues who in the past included also claim managers to hull and machinery insurers, designers, surveyors to classification societies.

5. ACHIEVEMENTS

5.1 FACTS AND FIGURES

The program of seminars is intended for the students of the final year of the course for Master Degree in Naval Architecture and Marine Engineering.

The number of students attending the seminars is high and corresponded to the 80% of the total numbers of students enrolled in the fifth year of the course. 48 students regularly attended the cycle 2014/2015.

The number of lessons had varied from the first series of the seminars, originally performed within 2/3 consecutive days, to the recent program of the seminars, which in the latest issue included 23 lectures, distributed within 5 months of the academic year. The complete cycle of seminars totalled 45 hours of instruction.

5.2 FEEDBACK BY THE STUDENTS

Feedback by the students is gathered in order to evaluate if the seminars are effective and meet the expectations, to help the lecturers selecting the topics of their seminars, to indicate to the organisers how to improve following cycles, and finally to better achieve the goal of the course.



Figure 10: Students and teachers at the end of the course

The feedback is based upon the answers given to some questions, filling a form anonymously by the students, specifically immediately after the end of each module of lectures and general at the end of the course.

The following considerations are referred to the latest two editions of the course, when the students were initially informed about the use of the questionnaire and not obliged to fill it in. However at least 50% of the students did submit their evaluations.

The students could rank the seminars from poor to excellent, which was intended to check the strong and also the weak points of the seminars. Both types of evaluations give information for updating and improving the course.

In order to simplify the compilation of the forms, the questions were to a large part of a judgmental nature rather than descriptive. Descriptive feedbacks and comments were equally received through personal contacts.

There were cases of exceptionally good lectures, very vivid and interesting, which fascinated the students, whilst in other (few) cases they were considered too academic.

The parameters for evaluation of each module were:

- Interest on the subject
- Utility
- Dedicated time appropriate to cover the subject
- Clearness in the presentations
- Interests to further study the subject.

The overall evaluation of the course was based upon the following parameters:

- Reasons for participating in the course
- Satisfactory level of instruction achieved compared with expectations
- Educational quality of the course
- Utility of the course for students' own instruction.

The following indications were drawn in connection with the subject of the different modules:

- The highest level of interest and appreciation was achieved by the modules Brokerage (90% high and very high) and Design management (74%).
- The lowest interest (30% of evaluations poor) was expressed for the non-technical subjects (Shipping law and Ship Economics matters), although, as far as Economics is considered, request of further discuss in more details the different forms of ship financing was suggested.
- As to the utility of the modules, the highest valuations (80% good and very good) were achieved by Brokerage and Vetting.
- The dedicated time was generally estimated adequate, but for some modules the numbers of hours were changed, in accordance with the feedback by the students.
- The judgment on the clearness in the presentations by the lecturers was positive in the largest part of the modules. However the presentations of some lectures proved to be too complex, especially for the topics where no specific knowledge is in the students' experience.
- There has been a clear indication of interest to further deepen the knowledge of subjects as Design management, Brokerage, Vetting. Less interest was expressed for Safety and certification, Ship Economics, Shipping law.

As far as the general evaluation of the course, the following feedback was achieved in connection with the selected criteria.

- In the two recent editions of the course the main drivers to participate were the spotting of professional future possibilities and the interest in the management of the profession. Only 25% of the students indicated the completion of the education as the main driver.
- The satisfaction to meet the expectations was evaluated high (83,5% and 82% of the replies, in the latest editions).
- The quality of the education process was evaluated good, with 77% of positive evaluations (23% of the students valued excellent the quality).
- The utility of the course received 59% of positive evaluations.
- No totally negative evaluations were recorded. Only percentage of less than 18% recorded poor evaluations for the satisfaction in connection with the initial expectations and with the utility of the course for the students' education.

5.3 SPEAKERS' POINT OF VIEW

The speakers are not professional teachers, therefore preparing a lecture is in a someway a challenge for all of them.

Although strongly motivated and willing to provide a valuable service to the University, it is a fact that they do

not have the habit to speak to youngsters who are at least in the age of their sons/daughters.

The common concern is how to make the presentation interesting enough, without overloading the audience with data and information. On the other hand they want to be precise and accurate, without risking genericity.

Of course, any lecture needs to be organized in advance and this is in general an excellent occasion to put in order ideas and information that are in the mind but they need to be rationalized.

The students are often well prepared and curious, and their questions at the end of the lectures are generally straight and at the point, needing in return answers similarly structured. This is not so easy without being accustomed.

However, the final feeling after any lecture is a sort of "rejuvenating", which is definitely welcome.

5.4 PROFESSIONAL DEVELOPMENT

The scheme in which the lectures are nowadays organised brought to the understanding that they were not only a learning occasion for the students, but for the speakers as well, for they are an excellent occasion in which professionals having a similar background but actual different businesses/interests can meet and share experiences.

This is of course possible also in conferences, meetings and various courses, but the meetings at the University are much less formal and they give a more direct opportunity.

This was obvious since the very first years, because there were speeches about the role of the designer, of the maritime consultant, of the surveyor etc., but it is of course more evident in the recent past, as there were contributes by highly specialised professionals (e.g. claim managers usually dealing with piracy-related cases, experts in personal health and safety issues, fleet managers daily facing the Majors' vettings and their consequences) which were of high interest also for the other speakers who had the opportunity to attend.

The same speaker, being obliged, as mentioned in the previous section, to rationalize his/her own knowledge preparing the speech, is also forced to clarify the areas which himself considered oblivious and that sometimes they are not as such at all. This is, altogether, an excellent occasion for professional development, of which speakers are fully aware.

Quite recently also in Italy, similarly to other European countries, the need of having a continuous professional development has been regulated by a specific law, which requires to all the professionals, and of course also to the naval architects and marine engineers, to establish a

scheme in which they have to attend to specific course and/or other learning opportunities.

6. CONCLUSIONS, THE FUTURE

The learning activities available to the students of the last year of the Master degree are ample and several opportunities are available to gather the required number of ECTS. Nevertheless, the percentage of students choosing to attend the seminars is high, as the majority of them prefer them to other options.

The degree of appreciation is high and from the analysis of the answers given to the questionnaires it is clear that their expectation is not to receive technical contents in addition to those of the academic courses, nor to deepen the knowledge in some of them.

Instead, the students want to be informed about the different types of jobs in which they will be involved after the degree, with a particular emphasis on how their academic studies will interface with the skills the industry will require. In other words, the students want to be helped to orient themselves for their future.

It is therefore obvious that the benefit of lectures given by different professionals in full active life is quite in line with students' expectations and the experience of the seminars will continue. Also, taking into account suggestions from the industry, the issue of developing good communication skills, both oral and written will be incorporated in new modules.

In practice, far from being a monolithic structure, the seminars adapt themselves both to the expectations of the students and to the suggestions coming from the industry, in a two-way flow that is in full compliance with the original aims of the Royal School of Naval Architecture and Marine Engineering, since the 19th century although with new and up-to-day instruments.

7. REFERENCES

- [1]. [M FIGARI], Higher education in marine technology at Genova University, *RINA*, 2006.

8. AUTHORS BIOGRAPHIES

[Gianfranco Damilano] Graduated as Naval Architect and Marine Engineer at the University of Genova, after a period of scholarship in the Faculty of Engineering in Genova, he joined RINA, the Italian Classification Society, in the Research Dept, where he became expert in ship structural analysis. Then he held a series of senior positions in several RINA's on site offices, carrying out surveys on board ships and supervision during construction of newbuildings in Italy and abroad. He is presently Secretary of the Genoa Branch of ATENA

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