2016 / 2017 REPORT
The Mondragon Higher Polytechnic School was created in 1943 on the initiative of Father José María Arizmendiarieta, Founder of the Mondragon Cooperative Experience. It has not stopped growing since the outset, also giving rise to the creation of many innovative business experiences.

A major landmark in the history of the School was the founding of the Mondragon cooperative movement’s first industrial cooperative society, ULGOR, S. Coop., by five of its technical engineers in 1956.

Another milestone was the creation of the industrial cooperative society ALECOP in 1966, which enabled students to combine their studies with work at a company.

Later on, in 1972, internationalisation took place when the first university exchange programmes were organised with centres abroad. The School has also been actively involved in numerous international Training and Research & Development projects since 1986.

The year 1974 marked the creation of the IKERLAN Research Centre, which is now one of Spain’s most cutting-edge technology centres, employing over 200 researchers.

In 1983, the Gizabidea Private Educational Foundation was recognised, posthumous work of Fr. José Maria Arizmendiarieta, and it took over the running of the School’s buildings.

The School has also played an active role in other socio-corporate initiatives over the last three decades, such as DIARA, a pioneering Industrial Design company founded in 1985, and various education centres. More recently, in 1996, the company CEI SAIOLAN was created as a business incubator for new enterprises in advanced sectors, although this activity had already been delivering benefits since 1984.

In 1995, the Higher Polytechnic School became the first university centre in Spain and one of the first in Europe to obtain the ISO ER353/1/95 Quality Certificate.

It should be noted the constitution of Mondragon Unibertsitatea (Mondragon University) in 1997, along with two other university centres in Alto Deba: ETEO S. Coop., from Òñati, and Irakasle Eskola S. Coop., from Eskoriatza, currently ENPRESAGINTZA and HUHEZI, respectively.

In 2002, in collaboration with the Goierri Foundation, the HPS campus was started in Ordizia.

The Silver Q Award was received in 2003-2004, with a score of over 400 points in an external evaluation conducted by EUSKALIT.
In 2008, the School was the first Basque University to adapt its engineering studies to the new European Higher Education Area.

September 2010 saw the official opening of the Centre for Technological Research and Innovation in Electronics and Embedded Systems, located at the Garaia Innovation Park and which combines research and training in the fields of electronics, computer science and telecommunications.

In September 2013, the HPS, in alliance with Orona Ideo, opened the new campus in Donostialdea in the Orona Foundation building.

In July 2014, the AUDIT Certification was awarded after the assessment by UNIBASQ and ANECA.

In 2014-2015, we celebrated the 100th anniversary of the birth of Jose Maria Arizmendiarríeta.

**COMPOSITION OF THE HIGHER POLYTECHNIC SCHOOL**

The legal name of Mondragón University’s Higher Polytechnic School (HPS) is Mondragon Goi Eskola Politeknikoa (MGEP). It is a mixed cooperative with three types of members in equal numbers:

- Working partners.
- User partners (Students).
- Collaborating partners (Companies and Government bodies).

The Assembly, which is its ultimate decision-making body, and the Governing Board, which establishes its lines of action, are both made up of equal numbers of these three types of Partners. This structure enables the students and companies to become directly involved in running the centre.

Bearing in mind that the main mission of the HPS is to train students for a professional career in an industrial environment, the legal formula of the mixed cooperative, which has been integrated into the business world and, in our case, mainly into the cooperatives, has been an essential factor in its constant evolution and adaptation to external demand.

Similarly, the real possibility for our students to complete a training in alternation (study-work) is a key added value throughout our development. As is the performance of the degree and master’s final projects/thesis in companies or in the HPS itself under contract R&LD projects with companies.

The employment status of the HPS’ teaching staff is equivalent to that of professionals belonging to an industrial cooperative. Specifically, aspects such as the working calendar, timetables, wages and the staff promotion system are all equal.
This activity report contains a sample of the most significant achievements of the Higher Polytechnic School of Mondragon Unibertsitatea (MU-HPS) throughout the academic year 2016-2017. The contents are organised according to our Mission, which is to transform society through the integral training of people and the generation and socialisation of knowledge in the scientific and technological field. We seek excellence to give the best service to our students, companies, and institutions.

The academic year 2016-2017 was the first of the new strategic cycle and was, therefore, the right time to incorporate the planned changes in the organisation, its business, and its activities. We collect in this report the main lines of action and accompany this report of data, figures, and qualitative assessments.

The global dimension of the Polytechnic School of Mondragon Unibertsitatea (MU-HPS) has been 7% higher in the academic year 2016-2017. With respect to the previous year, we have trained more engineers, technicians and professionals, researched more with better results, and transferred more knowledge to the industry and society in general.

With regard to the Regulated Training activities (whose direct clients are the students of the Undergraduate, Master’s and Doctorate Degrees in Engineering, as well as the Higher Degree Training Cycles), we have maintained the offer of 9 undergraduate and 5 Master’s degrees taught on the Arrasate, Goierri, and Orona-Ideo campuses. We have also dedicated many efforts to renewing our academic offer. In particular, we must highlight the work carried out to redesign all Engineering degrees, in line with the provisions of the Strategic Plan. Additionally, we have designed two new degrees that contribute to the expansion of the academic offer – the dual Degree in Mechatronic Engineering, with a special design for students from professional training, and the Master’s Degree in Biomedical Technologies, with 90 ECTS, to offer a specialisation and continuity to the students graduated from the degree of Biomedical Engineering.

In the Professional Training (PT), it should be noted that the Deputy Council, alongside Tknika (Professional Training Innovation Centre) has assigned us the coordination of the Digital and Connected Factory Node, which makes us responsible for leading the orientation of the PT Centres to respond to the challenges posed by Industry 4.0. In addition, we have continued with the deployment of the ETHAZI Model of active methodologies and the delivery of the Higher Degree Training Cycle in Industrial Mechatronics in a partial offer format, to respond to the requalification needs of professionals, in particular members of cooperatives in relocation processes.

With regard to Non-Regulated Training activities (or for professionals), whose main clients are companies and institutions, the academic year 2016-2017 involved 2,453 professionals, 6% more than in the previous year, in the more than 238 courses that we have taught. As important developments, this year, we successfully completed the Master’s Degree in Casting Technology Innovation (iCasT) and launched a new executive
Master’s degree in Logistics and Purchasing, as well as creating and launching two other courses – Industrial Automation and Cybersecurity – which began in September 2017.

The Research and Transfer (R&T) activity increased by 9.5% in the academic year 2016-2017. Nine R&T Groups were recognised as excellent in terms of research by the Department of Education of the Basque Government, while U-Multirank classified us as the first university in the state and the seventh in Europe in knowledge transfer.

Each R&T Group starts up training and knowledge generation projects with the aim of anticipating, to a certain extent, the needs of our client companies, which we help improve their competitive position through transfer projects. The main proof of the value we bring to the company is that over 50% of the research activity financed by companies, mostly at the industrial level, is linked to the existence of a long-term collaborative research programme. We work in this model with leading companies in their sectors such as Orona, ITP, CAF, the Components Division of the Mondragon Corporation, Fagor Arrasate, Ingeteam, Ampo, Fagor Ederlan, ULMA, Ormazabal, Batz, Matrici, Sener, etc., as well as smaller SMEs, with fewer resources and which demand personalised care, such as EKIDE, Shuton, etc.

We must not forget to mention the confidence that the institutions place in our project. Therefore, we should thank the Basque Government for its support, above all the difficulties, especially through the University Plan managed by the Department of Education, as well as the support of the Economic Development & Infrastructure and Employment & Social Policies. The support of the Department of Innovation, Rural Development and Tourism from the District Council of Guipuzkoa has also been significant. Lastly, we had the support of the Ministry of Economy and Competitiveness of the Central Government. The support programmes for knowledge agents and the competitive calls promoted by these institutions enable, first, the development and transfer of knowledge and technologies to our industrial and service fabric. Second, they help us develop the activity of continuous training and promote the renewal of knowledge and skills of professionals with a technical profile. Finally, it contributes to improving the training of students in technical and engineering studies, so that young people can develop the competencies that make them the engine of change in the companies in which they are integrated when they finish their studies, guiding them towards activities with an increasing added value.

Contrary to the common belief, the orientation towards business interests is compatible with
scientific excellence. In this academic year 2016-2017, twenty-three theses were defended, with an additional 105 theses underway, a large majority of which are financed entirely by companies. Regarding scientific production, in the academic year 2016-2017, we published 27 articles in publications included in the Journal Citation Report (JCR), 46% of which correspond to publications from the first quartile and another 33%, to publications from the second quartile, which gives an idea of their quality. This course was especially positive in the European calls where we obtained 11% of the research and transfer funding, with a total of 25 active projects, 10 of which were started this academic year.

The development of all these activities would not have been possible without the involvement of the 491 people (partners, contractors, doctoral students, and scholarship holders) who, with enthusiasm, commitment and responsibility, have promoted the project of the Higher Polytechnic School. This is an educational project geared to the development of a free society, committed to its future.

Finally, we share quantitative data to measure the activity: Total turnover for the financial year 2016-2017 reached €30,694,000, which represents a growth of 7% over the previous year.

The legal surplus before the provision of the COFIP (Contribution for Education, Cooperative Promotion and Other Purposes of Public Interest) and after the retribution of the interests to the contributions was €349,000.

Ordinary investments made and undertaken during the year amounted to €1,485,000, 6.8% higher than the previous year's figure, being financed mainly by grants from the FEPI (Inter-Cooperative Education and Promotion Fund) of the MONDRAGON Corporation and the Basque Government.

With respect to the balance sheet as of 31/08/2017, it reached the figure of €59,338,000, the solvency ratios (1.76) and independence (2.74) standing out positively.
FORMACIÓN REGLADA
PROFESSIONAL TRAINING

>> DEVELOPMENT OF THE ACADEMIC ACTIVITY

Professional Training continues to be an important part of our academic activity. During the academic year 2016-2017, 250 students were trained in the following Higher Degree Training Cycles:

- Advanced Technician in Industrial Mechatronics.
- Advanced Technician in Mechanical Manufacturing Design.
- Advanced Technician in Mechanical Manufacturing Production Programming.
- Advanced Technician in Network Computer Systems Administration.
- Advanced Technician in Industrial Robotics and Automation.
- Advanced Technician in Electrotechnical and Automated Systems.

In collaboration with the MONDRAGON Corporation and the Deputy Council of Professional Training and Continued Learning of the Basque Government, we continue with the training in partial offer format in the Industrial Mechatronics qualification (combining studies with work) to respond to the training needs of the cooperative members of the MONDRAGON Corporation. In total, 60 workers are being trained in two promotions, with 30 workers in the first class who have completed their studies in this modality (in the absence of Work Centre Training).

As part of the training, our students participated in the SCE – Industry Automation 2017 Contest, organised nationwide by Siemens, obtaining an outstanding fifth place among all the participants from all over the state.

A fundamental element of the courses is Workplace Training (WT), which enables both students and work experience tutors to work directly with companies. There have been 52 students who have conducted these practices and 35 companies that have hosted them. Simultaneously, in collaboration with HETEL (Association of Professional Training Centres created by the Social Initiative), four conducted internships in companies abroad through the ERASMUS+ Programme in the Netherlands, Poland, and the Czech Republic.

On the other hand, the study-work programme format (DUAL study-work programme promoted by the Basque Government) is a very enriching learning model based on the acquisition of skills in a working environment. There is a clear commitment by us to this programme, where the close relationship between MGEP, students and companies means that both our students and companies obtain a more than satisfactory result. This academic year, we have trained 34 students, and another 46 have started the programme at the end
One highlight is the overall satisfaction of both our students and the companies that take part in the training of our students both in the academic part held at MGEP (particularly the group practices and projects) and the Work Centre Training and DUAL Training, being key indicators of our activity.

**>> INNOVATION IN THE TEACHING-LEARNING PROCESS**

During the academic year 2016-2017, we continued with the redesign of learning processes based on the achievement of learning outcomes. This knowledge will be the professional competences which the students must achieve in order to participate in the work environments.

This redesigning and adaptation of the objectives for each qualification have set the foundations in the development of the educational model, progressing in the active methodologies and taking continuous assessment a step further. The introduction of practice-based learning, i.e. based on know-how, has meant the transformation of the elements of the learning-teaching process. Practical learning and learning by doing put the focus on the student. Therefore, the teacher’s and student’s roles change in the new model.

The student adopts the role of technician who performs projects in which he/she experiments and builds situations that will arise in the near future in the labour market. For this purpose, the student must suggest what must be done and how to do it to resolve a problem or respond to a need.

In this academic year, all degrees implemented the bases for the development of the new challenge-based learning methodology in the classroom, in addition to implementing a contrast with the companies of our environment to validate the professional competences to be acquired by our students.

**>> TECHNOLOGY INNOVATION AND INVESTMENTS**

The major technology evolution, particularly in technology connected with university-level courses in Higher Degree Training Cycles, has led us to an important investment effort in order to renew and adapt our laboratories and facilities. This was financed by Inter-Cooperative Education and Promotion Fund (FEPI) resources received from MONDRAGON and equipment subsidies from the Basque Government’s Education Department, and, more specifically, the Vocational Training Directorate. The investment was mainly made in the fields of Mechanics, Electronics, IT and Manufacturing.

On the other hand, for an efficient use of these media, technological projects such as prototypes,
models, manuals, etc. are developed to assist in the academic activity of both students and professors in the implementation the practices of workshops and laboratory practices.

In collaboration with the Deputy Council of Professional Training and Continued Learning of the Basque Government, through TKNIKA, we have participated in the following programmes:
- Tkgune Automotive programme
- Digital and Connected Factory Node:
  - Innovation projects:
    - Micromanufacturing, in collaboration with HETEL as a BETEKU project.
    - Plastics Injection in Industry 4.0
    - 3D Printed Materials.
    - Hot stamping tooling made of UHSS steels and cut from composite materials.

>> ENTREPRENEURSHIP

This academic year, we continued our activity with the entrepreneurship working group, geared to motivating the entrepreneurial culture. In addition, our participation in TKNIKA’s Urratsbat scheme enabled us to enhance this area through exchanges of experiences.

The following activities were developed:
- Awareness talks on entrepreneurship and intrapreneurship.
- Search for complementary training for the students’ professional development.
- Search for employment opportunities in today’s complex market.
- Empowerment for creation and launch of the students’ own business ideas.

In the academic year 2016-2017, all Higher Degree Training Cycles participated in the IKASENPRESA project, which consists of a pedagogical tool based on practical experience (development of a business project) and interaction with external agents. The project includes an ENTREPRENEUR FAIR, which was held in February and involved all the centres participating in the scheme. The objectives pursued with the project are:
- To promote the development of entrepreneurial competition.
- To give students the opportunity to find out about local institutions, entities and companies and to contact them.
- To clarify misconceptions about the world of the company.

>> RELATIONSHIPS

As an associated centre, in addition to our relationship with the Deputy Council of Professional Training and Continued Learning of the Basque Government, we also participate in different programmes implemented by the Guipuzcoa and Lanbide Regional Government.

We maintain relations with educational centres and associations in our region and in other areas. This includes membership of HETEL, in its capacity as a member of the Association of Professional Training Centres created by the Social Initiative, which is present in numerous regions of the Basque Country.

ENGINEERING

During the academic year 2016-2017, 9 undergraduate Degrees, 5 Master’s Degrees and one Doctorate degree, adapted to the European Higher Education Area (EHEA), were offered. The degrees offered were as follows:
- Degree in Mechanical Engineering
- Degree in Industrial Design and Product Development Engineering
- Degree in Industrial Organisation Engineering
- Degree in Industrial Electronics Engineering
- Degree in Computer Engineering
- Degree in Telecommunications Systems Engineering
- Degree in Energy Engineering
- Degree in Industrial Process Ecotechnology Engineering
- Degree in Biomedical Engineering
- Master’s Degree in Business Innovation and Project Management
- Master’s Degree in Strategic Design of Products and Associated Services
- Master’s Degree in Industrial Engineering
- Master’s Degree in Energy and Power Electronics
- Master’s Degree in Embedded Systems
- PhD in Mechanical and Electrical Engineering

In collaboration with ANECA (National Agency for Quality Assessment and Accreditation) and UNIBASQ (Agency for Quality Assessment and Accreditation of the Basque University System), the Master’s Degree in Embedded Systems and the Undergraduate Degree in Energy and Power Electronics were favourably evaluated in the ACREDITA programme. In turn, the Degree in Industrial Design and Product Development Engineering
and the Degree in Industrial Organisation Engineering received the EUR-ACE® seal – a certificate granted by ANECA – as a centre authorised by ENAEE (European Network for Accreditation of Engineering Education), which evaluates engineering degrees according to a set of defined standards, in accordance with the principles of quality, relevance, transparency, recognition and mobility contemplated in the European Higher Education Area.

>> ACADEMIC ACTIVITY

Throughout the academic year 2016-2017, the planned academic activities were carried out, fulfilling the development provided in the management plan.

In our work to train competent young people, 1,668 students developed their academic activity of Engineering at the Higher Polytechnic School, 1,295 of which were undergraduates, 268 were Master’s degree students, and 105 were doctoral students. Of these, 263 were undergraduates, 148 were Master’s degree students, and 11 were doctorate students. This amount is 20% greater than in the academic year 2015-2016.

From the qualitative standpoint, we highlight the work carried out in the framework of engineering degrees for their redesign, as an activity that leverages the strategic purpose of achieving a coherent, unique and sustainable degree offer. Furthermore, it is worth mentioning the design work of two new degrees that contribute to the expansion of the academic offer, which are: the Degree in Mechatronic Engineering, an innovative offer for two reasons. First, there is the access profile, as an offer that aims to attract professional training students; and second, the proposed learning methodology, with dual training. The second degree is the Master’s Degree in Biomedical Technologies, a degree with 90 ECTS, which aims to offer specialisation and continuity to students graduated from the Degree in Biomedical Engineering.

>> EDUCATIONAL MODEL

Our institution is characterised by providing practical, business-oriented training within an increasingly international framework. To advance in this challenge, we continue to develop and implement our own distinctive educational model, which is based on the following cornerstones:

- Intensive use of active methods in the teaching/learning process.
- A model based on developing and acquiring skills and learning outcomes following a subject-based model.
- Continuous overall assessment of students as a key tool for assessment of competencies.
- The study-work programme, with in-company work experience.
- Internationalisation of studies and end-of-course projects.
- Teaching in three languages.
- A change in the role of the teaching staff and students.

Learning Methodologies

The EHEA (European Higher Education Area) advocates focusing the students’ learning around the acquisition of competences (technical and cross-sectional), as opposed to learning focused on knowledge acquisition.

In this sense, during the academic year 2016-2017, we worked on two pilot projects. The first of them aimed to experiment with new teaching methodologies, based on Tics tools in the subjects of Fundamentals. Work was carried out on the design and development of teaching materials and activities that contribute to the development of basic skills while encouraging student participation and motivation and ensuring the improvement of academic results.

Additionally, according to the design and implementation of a tutoring project for first-year students, in line with the differential element defined in the strategic plan of closeness to the student and individualised monitoring. Based on an analysis of mentoring/tutoring models in different universities, a model was designed that would fit with the particularities of our educational model. The practical experience was carried out with a group of 120 students.

The implementation and assessment of these two pilot projects has helped us establish the initiatives to provide continuity in following courses.

In relation to learning methodologies, the semester project model developed during the previous year was defined and put into practice, making the exercise of combining its basic elements and establishing the bases for its implementation.

For students to discover the usefulness of theoretical principles and to develop technical skills, we use the following teaching methods for all the subjects on our courses:
- Theory classes and lectures in the classroom.
- Classroom exercises. Problem-solving individually or in small teams (cooperative learning).
- Practical sessions in the computer room. Scheduled practical activities using a software application as a working tool.
- Practical work in laboratories. When necessary, use of equipment or machinery for testing, measuring, etc.
- Case work and/or studies. Students draw up a report and present it in class.
- Shared projects called PBL projects. One project is carried out each semester, concentrating on knowledge development and the practical application of technical and across-the-board skills.
- POPBL (Problem-Oriented Project-Based Learning) in Degree courses. Students are posed with a problem, which they must solve through a project.

Skills Development and Assessment

The fact of focusing the learning on the acquisition of competencies has required that the evaluation system be necessarily adapted, so that the evaluation system contemplates the continuous evaluation, feedback, and global assessment.

The assessment system that leverages the development and assessment of competencies has evolved since its first design in 2008, where the maturity of the system was evident in each of the proposed changes. The last of the changes was caused by a demand from teachers. This change implemented during the academic year 2016-2017 meant the elimination of one of the existing restrictions, to enable passing the course with competencies not yet completed.

Linguistic model

Technical English is included during the first years as a subject of study; verbal and written communication in English is included as a cross curricular subject in both the writing of the technical report in the presentation and when arguing the thesis; and technical subjects taught in English are also offered throughout the different years of the degree.

In 2014-2015, the proposal for an integral semester in English began, namely in the first semester of the 3rd year. We can thus facilitate the integration of students from other universities and countries in each of the degrees offer our students the possibility of having the internalisation experience at home. In 2016-2017, 7 of the 9 offered degree courses were taught in English, and work is being carried out so that this can be done in future courses for all degrees.

In order to ensure that our students can reach the level equivalent to C1 of Basque, the offer of two technical Basque courses was maintained, which helps to ensure that the requirements for said equivalence are met.

Study-work Programme

A significant number of students of the school combine studies with work, either in the facilities of the School
itself, as assistants in the departments and research laboratories, or in other companies and technology centres of the environment.

The total number of engineering students who combined study and work in the academic year 2016-2017 was 331.

**END-OF-COURSE PROJECTS**

The main purpose of the End-of-Course Project area was to obtain quality applications from companies that were suitable to the students' professional profile, with well-defined objectives, an adequate dimension according to the length of the projects, and with highest possible technology level to meet their needs.

As significant data, the total number of students who have completed the End-of-Course Project during the academic year 2016-2017 was 322, with a total of 523 project applications received. Through the ERASMUS+ Mobility Programme, bilateral mobility agreements or university company agreements, the End-of-Course and End-of-Master's Projects were developed, mainly in European countries such as the Czech Republic and Slovakia, but also with presence in non-EU countries, such as Mexico.

**DOCTORATE**

Throughout the academic year 2016-2017, we have continued with an intense training activity in the third cycle. Consequently, the student body enrolled during the academic year was composed of 105 Doctorate students, and 23 theses were defended, 9 of which obtained the European or International Doctor Mention and 16 obtained the CUM LAUDE mention.

The doctoral theses read during the academic year were as follows:

*Engineering Doctorate Programme*

- Agirre Bastegieta, Joseba Andoni
  Method for adapting legacy m2m transformations to changes in the mapping logic and to meta model extensions using profiles.

- Arrinda Vicandi, Josu
  Storage systems for the effective integration of renewable generation in the electricity grid.

- Arruti Monasterio, Egoitz
  Wireless Channel Model and LDM-Based Transmission with Unequal Error Protection for Inside Train Communications.

- Cuesta Zabaljauregui, Mikel
  Analysis of the superficial integrity in the process of machining holes on Inconel 718.
· Esteban Echeverria, Ekaitz
  A model based virtual sensing approach for the predictive maintenance of elevator installations.

· Fernandez Manchado, Raul
  Knowledge-based methods for grinding wheel selection in grinding processes.

· Garmendia Elorza, Maitane
  State-of-charge (soc) algorithm design methodology for implementation on battery management systems (bms) of industrial li-ion battery-packs.

· Madinabeitia Olabarria, Damian
  The effect of high-performance work systems and people’s attitudes on organisational performance: A multilevel, longitudinal analysis.

· Martinez De Pancorbo Gonzalez, Sergio
  New topologies of reluctance synchronous motors for traction applications.

· Nicolas Ramirez, Carlos Fernando
  Model-based testing processes for safety-critical embedded systems.

· Torrano Zabalza, Ivan
  Low-speed wind tunnel design, setup, validation and testing of airfoils in turbulent inflow conditions.

Doctoral Programme in Mechanical and Electrical Engineering
· Alacano Loiti, Argiñe
  Modelling and analysis of distribution systems in DC, oriented to ships with electric propulsion.

· Bernabe Artola, Unai
  Analysis of comments in social media using Natural Language Processing techniques.

· Chamorro Sánchez, Xabier
  Microfusion of Ti-6Al-4V: Analysis and Control of Defects.

· Del Olmo Larrañaga, Jon
  Active diagnosis of railway traction units in case of sensor failures.

· Iturbe Intxaurraga, Ariane
  An Analysis Of The Turning Performance Of Alloy 718 Plus, In Terms Of Tool Life And Surface Integrity, In Comparison With The Base Material Inconel 718.

· Iturbe Urretxa, Mikel
  Data-Driven Anomaly Detection in Industrial Networks.

· Llavori Osa, Iñigo
  Numerical simulation and experimental validation of fretting fatigue and wear phenomena in low-diameter drawn steels.

· Martinez Laserna, Egoitz
  Methodology for the Techno-Economic Assessment of Second Life Lithium-Ion Batteries.

· Mccloskey Gomez, Alex
  Prediction of noise and vibration of electromagnetic origin in electrical machines.

· Sethy, Ritanjali
  Glass coating effects on Ti-6Al-4V hot forging.

· Ugalde Murgoitio, Unai
  Location of structural damage through a substructure-based approach.

· Zarraga Rio, Ondiz
  Brake-clutch squeal prediction and suppression.

INTERNATIONAL RELATIONS

The International Relations activity in the academic year 2016-2017 continues the development of the actions initiated in the previous years, emphasising not only those related to external mobility, but also the internationalisation of students who do not have that experience. This is the concept “internationalisation at home”. The actions were, specifically:

· To ensure that one third of the students from the Degree and Master’s courses have an international experience of at least one semester during their period of study.

· To promote “internationalisation at home” via the inclusion of contents in the study plans, inclusion of incoming students in the activity and university life, and the consolidation of a semester completely in English in each Degree course.

· To reach a number of national and international exchange students in accordance with the size of the HPS, so that they may contribute to the Internationalisation of the campus while performing a sustainable activity.

· To renew and activate collaboration agreements with foreign universities within the new European strategy Horizon 2020. In particular, to work on the participation of networks and strategic alliances with other institutions which, in some cases, may lead to joint qualifications.

· To boost the participation of the HPS in the internationalisation process of local companies, both via its assistance in training a qualified workforce and by taking part in joint initiatives with foreign companies and/or institutions.

· To continue coordinating and participating in European Projects such as the current Erasmus Mundus LAMENITEC (with Latin America, which ended in 2016) and INTERWEAVE (with Asia, which ended in 2017). The participation in programmes within the Horizon 2020 framework programme is vital to increase the visibility of the HPS.
The following is a quantitative demonstration of some of the actions materialised in the academic year 2016-2017:

**a. Actions aimed at promoting the mobility of students from the HPS.**

- Monitoring and strengthening of the current double degree courses:
  - INSA Toulouse (France): Master’s Degree in Industrial Engineering and Master’s Degree in Embedded Systems.
  - ENSEEIHT Toulouse (France): Master’s Degree in Energy and Power Electronics and Master’s Degree in Embedded Systems.
  - ECN Nantes (France): Master’s Degree in Industrial Engineering.
  - University Skövde (Sweden): Master’s Degree in Embedded/Web Systems.

- Academic stay management (4th year of the Degree, 2nd year of the Master’s Degree, and Doctoral Programme).

Of the 251 people who submitted applications in the academic year 2016-2017, 161 students who developed mobility actions in the programmes below were selected, based on their academic record and foreign language level:

- Study Mobility: 117
- Project Mobility: 38
- Doctoral Mobility: 6

The countries in which our students were able to carry out a study stay are Germany, Austria, Belgium, Denmark, Slovakia, Spain, Estonia, Finland, France, India, Ireland, Italy, Mexico, Norway, the Netherlands, Poland, Sweden, Switzerland, Slovakia, and Thailand.

**b. Actions aimed at improving internationalisation at home.**

- 76 foreign students and from the rest of the state, are studying at HPS, within the ERASMUS+ and SICUE programmes and through INTER-UNIVERSITY AGREEMENTS. The visiting students came from: Germany, Argentina, Slovakia, Estonia, Finland, France, India, Italy, Mexico, Colombia, Guatemala, Honduras, Nicaragua, Japan, Hungary, Spain, Czech Republic, Sweden, Turkey, and Poland.

- To organise welcome and integration activities through the Buddies programme, for the fourth consecutive year. It is of great interest to strengthen this programme.

**c. Actions aimed at assisting the internationalisation of companies and society.**

- In the framework of participation in the process of internationalisation of Basque companies, 8 students developed their End-of-Course Project in implementations of Basque companies abroad: France (1), China (1), India (1), Poland (1), United Kingdom, (1) and Czech Republic (3).
TRAINING FOR PROFESSIONALS

In the academic year 2016-2017, 2,453 professionals participated in the 238 training programmes carried out, totalling 9,521 hours of training. More and more companies are coming to us to obtain tailored training combined with a professional development plan and support in the use of methods and tools. Throughout this year, 320 companies relied on us. 123 teachers accompanied these professionals in the learning process, with an average satisfaction score of 8.34.

During the academic year 2016-2017, within the calls published by Lanbide, a course associated with professionalism certificates of 590 hours in the Manufacture of Polymer Part Moulds and Light Alloys were taught. Additionally, through the call issued by Hobetuz, 16 courses were given, totalling 1,492 hours of training. A total of 241 professionals participated in these two professional training programmes for employment.

In the field of Industrial Organisation, in March 2017, the first edition of the Executive Master’s Degree in Integral Logistics and Purchasing began in Bilbao in collaboration with the Chamber of Commerce of Bilbao, ICIL Foundation and AERCE, and the 25th edition of the Professional Master’s Degree in Production Management in Mondragon. A total of 16 companies participate and train their professionals in these training programmes. During the year, two editions of the Advanced Course in Industrial Management were given, as well as over 20 periodic seminars in which experts presented different tools, methodologies and good practices of industrial organisation. A unique example was the conference in which a New Method for Supply Chain Management was presented.

At the Higher Polytechnic School, we understand that project management is a key competency for the development of our companies, as it is an essential part of their change and innovation projects. During the academic year 2016-2017, a new edition of the PMP (Project Manager Professional) Certification Programme was held. There are already more than 170 certified professionals, and 85.3% of the certificates in the PMP programme of the Basque Country carried out their training with us. During this year, different open training sessions and seminars were carried out.

Within the field of knowledge of Mechanical Engineering, over 30 open courses were given on the topics of Industrial Design and Product Development, Materials, Manufacturing Processes, Maintenance, and others. During the academic year 2016-2017, twenty in-company courses were carried out following this approach.

It is worth highlighting the accomplishment, within the framework of the Master’s Degree in Casting Technology Innovation (iCasT), of the four conferences with the participation of renowned national and international speakers, which analysed the current situation and future
prospects of the manufacture of metallic components by moulding.

In the field of Industrial Design, this year was marked by the 7th edition of the “Design Konferentziak”, in which participants met with the aim of creating a space for reflection on design as a business strategy and its applications in the world of sport.

Similarly, during the year, the 6th edition of the Expert Course on Patents in the business field in collaboration with Galbaian was held at the Chamber of Commerce of Bilbao.

Throughout the academic year 2016-2017, in collaboration with different companies, a new Master’s degree in Industrial Automation was designed. This new Master’s Degree has a very practical orientation, and participants develop practices in collaborating companies from its beginning. In September 2017, its first edition began, with 24 participants and 7 companies.

One more year, the ICT team of the Higher Polytechnic School organised and gave over 30 conferences within the framework of Enpresa Digitala on the subjects of Digital Marketing. It has participated in the Rioja Alavesa Wine Tourism Forum, in the Tourism conferences of Urdabai, Gipuzkoa Encounter, Araba Encounter, Euskal Encounter, Digital Transformation for the Mondragón ICT Committee, CRO at Bilbao Tech Week, and the ICT Week of Hernani, Bergara, and Tolosaldea. The Indusmedia, Interdigitala, KaixoWorld and WP Euskadi congresses were held, as well as 22 Technological Barnetegis organised in the fields of Industry 4.0, Tourism, and ICTs. As a complement to the training, the team of ICT professors has provided support to a number of companies in the application of these Digital Marketing tools, methodologies and strategies in their companies. During the academic year 2016-2017, the first edition of the Big Data Course was held, with two new editions planned for the academic year 2017-2018.

One of the most important challenges for the ICT team during the academic year 2016-2017 was the design, alongside the Provincial Council of Gipuzkoa, of a Master’s Degree in Industrial Cybersecurity. This Master’s Degree began in October 2017, with 15 participants, including both students who have recently finished their university studies and active professionals. There is a growing number of professionals who, with the aim of developing their qualifications, select new training formats that enable them to combine their training and their professional career. With the aim of responding to this need, during the academic year 2016-2017, various online courses were taught, including the Master’s Degree in Computer Security, the Expert Course on Computer Security, the second edition of the MOOC (Massive Online Open Courses) on Ethical Hacking, the Lean Manufacturing Course, the Integral Logistics Course, the Course on Quality in the Manufacturing Process, the Patient Experience Course, and the Steel Designation Course.

To respond to the demand arising from the implementation of the new undergraduate degrees, a new edition of the courses for adaptation to the Degree in Mechanical Engineering and the Degree in Industrial Electronics Engineering were launched online.

The strategy aims to strengthen the offer of Continuous Training with alliances and signing agreements in other fields of knowledge, an agreement has been signed with Global Lean for the design and launch of courses in 6 Sigma with their corresponding Black Belt certifications.

Finally, during the academic year 2016-2017, new training courses were designed for the academic year 2017-2018. This information can be consulted in the new web platform www.mondragon.edu/profesionales.

RESEARCH AND TRANSFER

Although the Autonomous Community devotes a greater percentage of its GDP to spending on R&D activities, the Basque Country remained at 1.89% in 2016. Nevertheless, MU-HPS was able to continue strengthening its Research and Transfer (R&T) knowledge activity during the academic year 2016-2017. On the one hand, this was thanks to the support of companies that have relied on us to conduct research with them and the institutions that have maintained and complemented their research grants and, on the other hand, to our success in the various research project calls, especially in Europe. Thus, in this R&T activity, we have grown by almost 9.5% compared to the previous year, reaching €12.5 million. It should be noted that 54% of this amount comes from private investment, which has grown by 14.6%, while the rest is due to a 4.2% growth in revenues obtained in competitive R&D calls that, thanks to our transfer model, also features in its horizon the application of the knowledge acquired in our collaborating companies.

These figures make us the university with the most relationships with companies (according to the research percentage financed by companies), and several
studies endorse us as the best valued in Innovation and Technology Transfer. For example, U-Multirank (2017) qualifies us as "excellent" in parameters such as: Research income from private sources or external financing for research. One of the keys has been, once again, the success of MU-HPS researchers in aligning their technological capabilities with the needs of the company. The main proof of the value that MU-HPS brings to the company is that 50% of this research financed by companies, mostly at the industrial level, is linked to the existence of a long-term collaborative research programme. The projects undertaken within the framework of these collaborative research and transfer programmes range from oriented basic research to industrial research and experimental development projects, which eventually lead to innovative products, processes, and services. Additionally, a long-term relationship allows us to align our basic research with the company strategy and train the talent they require. This results in a model with proven efficiency in the provision of a comprehensive, multidisciplinary solution to business requirements by an effectively coordination between the generation and transfer of knowledge.

On the financing of research in competitive calls, the CRUE (Board of Governors of Spanish Universities) R&TC report indicates that the Higher Polytechnic School triples the average funding by PDI (Research Teaching Staff) of the universities. In this sense, the academic year 2016-2017 was very positive in the European calls where we have obtained almost 11% of the funding of the research and transfer activity with a total of 25 active projects, MU-HPS being the leader of one of them. In the academic year 2016-2017, ten new concessions were awarded for European projects, representing an income of roughly €2.5 million for three years. Another noteworthy aspect is the financing obtained in calls of the Provincial Council of Gipuzkoa, which amount to 6% of the research and transfer budget with 25 active projects of its different calls. In the calls of the Basque Government, six projects of the Department of Education of the Basque Government were obtained (4 IBA and 2 EU). We are also present in a total of 55 Hazitek projects and 20 Elkarte projects of the Department of Competitiveness of the Basque Government, leading one of them for the first time. In addition, we participated in one CIEN project of MINECO (Ministry of Economy and Competitiveness).

Regarding scientific production in the academic year 2016-2017, 27 articles were published in journals indexed in the Journal Citation Report (JCR), 46% of which correspond to publications from the first quartile and another 33%, to publications from the second quartile, which gives an idea of their quality. Our publications stand out (U-Multirank, 2017) for their impact index, number of joint publications with foreign universities, and co-authorships with industrial partners.

Most of these results are linked to ongoing theses and are indicators of the good work developed by the researchers of the Higher Polytechnic School. It is also
worth mentioning the 23 doctoral theses defended and the 105 theses underway, a large majority of which are financed by private entities.

Another essential instrument, which allows our Research and Transfer Groups to remain at the forefront of knowledge, is the Specialisation Plan, financed by the Department of Education of the Basque Government, and which we managed to maintain during the last academic year. One of the most relevant actions implemented during the academic year 2016-2017 is the Doctors’ Plan, whose purpose is to improve significantly the qualification of the MU-EPS PDI through the completion of doctoral theses. It is expected that, in the medium term, this measure will involve a qualitative leap, in a phased manner over time, of the following indicators: the improvement of the research and teaching quality, the international dimension of the MU-EPS PDI, the number of high-impact publications (collected in the JCR) by PDI and by course, the dimension of the research activity, and the dimension of the transfer activity. This programme provides researchers with attractive working conditions to carry out their doctoral theses, which should result in the researchers’ growth aspects, the teaching quality, the R&T Group and the strengthening of alliances. Thus, during the academic year 2016-2017, 15 theses were financed within this plan.

Finally, nine of the research groups of MU-EPS have been recognised by the Basque Government as Excellent Research Groups of the Basque University System, five of them in Category A – the highest recognition – and another four in Category B. We should note these achievements are the merit of the researchers that make up the 17 Research and Transfer Groups grouped in the following Scientific and Technological Units:

**SCIENCE, TECHNOLOGY AND MATERIALS**
1. Plastics and Composites Technology
2. High-Performance Machining
3. Advanced Materials Forming Processes

**MECHANICAL BEHAVIOUR AND PRODUCT DESIGN**
4. Structural Mechanics AND Design
5. Acoustics and Vibration
6. Fluid Mechanics
7. Surface Technologies

**ELECTRICAL ENERGY**
8. Drives applied to traction and electricity generation
9. Electronic power systems applied to electricity control
10. Energy Storage

**INDUSTRIAL MANAGEMENT AND DESIGN PROCESSES**
11. Innovation – Management – Organisation
12. Diseinu Berrikuntza Zentroa
13. Productive Logistics Operations Management

**EMBEDDED SYSTEMS AND SMART SYSTEMS FOR INDUSTRIAL SYSTEMS**
14. Software and Systems Engineering
15. Robotics and Automation
16. Data Analysis and Cybersecurity
17. Signal and Communications Theory
PLASTICS AND COMPOSITES TECHNOLOGY

The main objective is to create and transfer knowledge about composite structural manufacturing processes and applications that meet lightening/weight, cost and productivity criteria. The focus is on targeted research projects that develop demonstrators or processes at the plant-pilot level. The activity is organised into three areas:

- Advanced resin transfer processes (RTM); RTM for thermoplastics (TP-RTM), RTM-Compression (CRTM), RTM for hybrid materials (FML-RTM).
- Ultraviolet curing technology applied to: Pultrusion (3D Pultrusion), automatic fibre placement (AFP), filament winding.
- Rapid prototyping based on advanced 3D printing technologies: Manufacture of moulds, structural elements, complex cores, local reinforcements, and non-conventional orientations.

Additionally, aspects such as the deformation and fracture of polymers and composites, stamping/thermoforming, impact/damage simulation and morphing are being addressed.

Among the industrial partners are companies in the machine tool (Fagor Arrasate), rail (CAF) and civil engineering (Acciona Infraestructuras, Irurena) sectors.

HIGH-PERFORMANCE MACHINING

The main objectives of the research group are the improvement of production processes by machining in different industrial sectors (automotive, aeronautics, machine tools, moulds and stamps, health, etc.) and the generation of ideas to manufacture innovative products or enter into new businesses and markets.

The general strategy followed is to create, alongside other research groups of MU-HPS, multidisciplinary teams including company personnel, research centres and universities, in order to give an advanced scientific response to industrial problems, for the subsequent transfer of knowledge directly or through highly qualified young people.

We work on (I) the definition of machining processes including the optimised selection of working conditions, tools and fastening tools, (II) approval of machining processes based on customer requirements, and (III) the development and pre-industrial evaluation of new machining technologies and products.

The group has extensive experience in simulation of machining processes, providing cutting-edge machining for milling, turning, broaching and grinding processes, as well as advanced experimental machining analysis techniques: high-speed filming, temperature measurement by thermography, electron microscopy, etc.

The main work areas are machinability of materials, study of the cutting and modelling process, design of machining processes, high-speed machining, micro-machining, grinding, smart machining, and biomachining.

In addition, this year, ENAC, the National Accreditation Entity, has awarded the Materials Laboratory of the Mechanical and Industrial Production Department of Mondragon Goi Eskola Politeknika the accreditation according to the UNE-EN ISO 17025:2005 standard for the performance of metallographic tests in the determination of particle size, determination of percentage of phases by automatic image analysis and measurement of surface defects in metallic materials. This accreditation will enable the High-Performance Machining research group to become a reference in the measurement of the damage generated in the material in manufacturing processes, including machining.
**ADVANCED MATERIAL FORMING PROCESSES**

The general objective of the group is the experimental characterisation, development and optimisation of materials, processes and tools, enabling the production of pieces that are adapted to the function for which they have been designed at the lowest possible cost. The experimental characterisation includes, whenever possible, the production of prototypes at the MU-HPS laboratories and the monitoring of processes in an industrial environment.

Similarly, the group is working on the optimisation of forming processes via the use of monitoring and control systems specially adapted to each process. This is intended to reduce the impact of the involuntary variations of the process parameters or external agents on the final result.

It works on the development, application and experimental validation of advanced behaviour models of materials adapted to the different processes (deformation, fusion, solidification, etc.) as a tool to optimise process variables and tool design. This includes, among others, multi-scale models which integrate mechanical, rheology, thermodynamic and microstructural evolution. The group has the necessary experience and know-how to implement these models in numerical simulation programmes as a base for process optimisation and development.

>> MECHANICAL BEHAVIOUR AND PRODUCT DESIGN

**STRUCTURAL MECHANICS AND DESIGN**

Growing competitiveness means that not only is it necessary to create technical solutions to respond to market requirements, but to ensure that these solutions have as much added value as possible. On the one hand, structures are exposed to increasingly tough conditions; on the other hand, they need to fulfil an increasing number of functions.

The objective of this group is to contribute to the launch of robust products while providing material behaviour models and techniques/tools for numerical simulation, which allow the evaluation and optimisation of their behaviour before their production begins.

To this end, the group addresses the following lines of research:

- Thermomechanical fatigue and residual stress management: improvement of the mechanical behaviour of the product before cyclic loads and control of residual tensions, by means of the modification of design variables, process variables, or application of thermal treatments.
- Development and optimisation of prototypes, assemblies, and mechanical components: optimisation of transmission elements (gears, ball screws, universal joints), characterisation of systems and mechanical assemblies (braking systems, brake-clutches, suspension systems), and development of prototypes and sensorised test benches.
- Advanced multiphase modelling: coupled analysis of the different physical phenomena that affect products, machines and processes (mechanical, fluidic, thermal, electromagnetic, chemical, etc.). The analysis of each phenomenon separately does not guarantee an in-depth study due to the interaction between them. The group has worked in sectors as diverse as mining (sludge transport), energy (Stirling engine, thermal management of batteries, heat pump), and glass (generation of residual stress in glass blowing).
- Agile product development (CAx automation): automation of tools for the transfer and implementation of the knowledge developed in a productive way in the company. The group has experience in both the development of customised tools and automation of commercial CAD/CAE/CAM software programs (SolidWorks, Unigraphics, ABAQUS, ANSYS, etc.).

**ACOUSTICS AND VIBRATION**

The main objective of the group is to optimise the vibroacoustic behaviour of structures and components, to reduce problems associated with vibrations and unwanted noise. For this, the activity focuses on the characterisation of materials, characterisation of components, as well as numerical simulation with the aim of predicting behaviour. The three main fields in which you work are the following:

- Characterisation of materials. Characterisation of mechanical and acoustic properties of variable materials in frequency, such as composite materials, sandwich materials, magnetorheological materials, elastomers. The group has a characterisation methodology, which has been validated through scientific articles.
- Identification of noise and optimisation of industrial components. Experimental measurements with the aim of identifying the different sources of noise. Subsequently, through updating and optimisation techniques, the final design of the product is addressed. Examples: Electric machines, brake-clutch (squeal problems), etc.
- Monitoring and diagnosis of failures in electromechanical systems. Modelling of the system and identification of different indicators that allow us to know the diagnosis of components.

**FLUID MECHANICS**
This group includes three lines of research: Thermofluidics; Complex Fluids and Magnetorheological Materials and is classified as a type A excellence group by the Department of Education, University and Research of the Basque Government.

The group’s objective is to generate new knowledge in basic research as well as in development and to carry out their technological transfer in the midterm, within the collaborative research framework.

The activities developed by the three lines of research combine models and methods, both analytical and numerical, with experimental techniques to respond to problems of Fluid dynamics, Aerodynamics, Thermodynamics, and Heat Transfer, Microfluidics, Biotechnology, Transport Phenomena and Magnetorheological Material. The results of these activities have created new work synergies that materialise in collaboration with internationally renowned institutions, such as the European Space Agency (ESA), among others.

**SURFACE TECHNOLOGIES**
The projects of this research group focus on the study of component surfaces to optimise their functionality. By means of advanced characterisation methods, the mechanisms and causes of failure due to friction, corrosion and fatigue of the surface are diagnosed, as well as the impact of microgeometry on these phenomena. Thus, it is possible to propose both materials and surface treatments, as well as suitable textures for each application.

- 3D topographic characterisation: the microgeometry of the surface directly impacts the phenomena of friction, corrosion, and fatigue. The control and design of the topography is key to optimise the functionality of the component. To do this, the 3D characterisation of the surface landscape and analysis of the effect of geometric parameters on the target function are necessary. The microgeometric analysis of profiles and surfaces is carried out both for measurements associated with undulation, roughness and micro-roughness and for measurements of island volumes, cavities, etc.

- Friction and wear: the tribological behaviour is analysed from the friction generated in the friction systems and the study of the wear mechanisms present. The in-depth study of the type of contact allows us to propose solutions from the design phase. We work from both a theoretical and experimental standpoint, as well as using numerical simulation techniques using finite elements.

- Corrosion and tribocorrosion: corrosion is analysed in different atmospheres, with potentiometry techniques. The tribocorrosion analysis identifies undetectable problems through an independent study of each degradation mechanism.

- Fracture-fatigue characterisation: the various analyses can be carried out through standardised tests or tests
that simulate the actual conditions of use, being it interesting to build devices designed on an ad-hoc basis for this purpose (cables, wheels, guides, slides, etc.). In addition, standard test protocols are also adapted to the needs of each application whilst new test methods are developed.

>> ELECTRICAL ENERGY

The future points towards a continuous increase of our society’s energy consumption. With a horizon set in 2050, governments are promoting policies to improve energy efficiency, diversify energy sources, and reduce emissions of gases into the environment. One of the key vectors for achieving these goals is Electrical Energy.

The research group addresses the knowledge and improvement of the use and transformation of Electrical Energy for applications related to transport networks and electricity distribution (distributed generation, integration of renewable generation systems, smart networks, active energy management, electricity quality, etc.), traction (railway, marine, and electric vehicles), and industrial goods (industrial process control, machine tools, lifting).

The specialisation lines are related to the field of power electronics, storage systems, and electrical machines. The design area, linked to a detailed analysis of the final application, enables electrical-electronic equipment to be optimally designed and specified from the start of its development.

DRIVES APPLIED TO TRACTION AND ELECTRICITY GENERATION

The aim of this research group is to develop the knowledge required for designing, modelling, simulating and controlling devices whose principle of operation is electromagnetism.

For the specific case of electrical machines, actuators and sensors, the aim is to master the process, which includes the design, construction and production of the most suitable control system. The specifications for the design of these devices and their control system are specific for each application and are taken into account from the first stages of development.

Thereby, the main issues to be tackled are:

- Modelling, simulation and control of electrical machines: design of vector, direct torque and power
- Design of Electrical Machines: design tools for electrical machines and actuators, and analysis of their behaviour using advanced analytical models and finite element techniques.
- Protection and Diagnosis in Electrical Drives: Implementation of offline and online algorithms for protecting the drive and early detection of failures at the drive or the application.
- Application analysis. The need to specify the electrical machine and the control system makes it necessary to master the final application. Therefore, particular emphasis is placed on knowledge acquisition in the fields of wind energy generation, vertical transport, and electrical traction.

ELECTRONIC POWER SYSTEMS APPLIED TO ELECTRICITY CONTROL

This research group develops scientific and technological knowledge about systems based on Power Electronics, applied to the control of electrical energy. Advances in the manufacture of high-power semiconductors and the development of new conversion topologies currently allow us to address applications for the integration of Distributed Energy Resources in the electrical distribution network: microsystems for electricity generation, electricity storage technologies, devices based on controls specific to each type of machine, as well as status observers, design of sensorless systems, adaptation of online and offline parameters, and automatic tuning of regulators.
power electronics for the improvement of supply quality, and resources that control electricity consumption or demand.

The integration of power electronics in the electrical system enables the study of its transformation with a view to making the system smarter, more reliable and more flexible, as well as the development of concepts of distributed generation and active distribution.

The research group develops research activities in:
- Integration of new power electronic components such as semiconductors based on silicon carbide or gallium nitride.
- Development of electronic power converters for different applications:
  - Electrothermal and mechanical design, along with its refrigeration systems.
  - Modelling, simulation and control based on the application requirements.
  - Development of new converter topologies: multi-level, matrix, multi-pulse, etc.
- Devices connected to the transport and distribution network to improve supply quality: FACTS, Custom Power, Medium-Voltage Switches, new protection systems for electricity distribution networks.
- Energy management and coordination of electrical and electronic parts as part of smart networks for the integration of distributed generation systems based mainly on renewable energies.

ENERGY STORAGE SYSTEMS

The research carried out by the group focuses on the development of scientific and technological knowledge of electricity storage systems. The electrochemical systems were based mainly on technologies such as batteries and supercapacitors, ranging from cells to modules and large storage systems.

The group participates actively in collaboration projects with Universities, Technology Centres and Companies of the environment, developing its activities in two MU-HPS Campi, located in Arrasate and Galarreta.

The Energy Storage Systems research group develops research activities in:
- Complete electrical, thermal and mechanical design of storage systems based on electrochemical cells.
- Electrochemical and thermal modelling of cells and battery modules and super capacitors.
- Algorithms and electronics for management and protection of storage systems.
- Sizing of storage systems with an emphasis on application, such as electric traction, integration of renewable energies, and autonomous systems.
- Electrochemical storage system feature analysis and experimentation.

>> INDUSTRIAL MANAGEMENT AND DESIGN PROCESSES

INNOVATION – MANAGEMENT – ORGANISATION

The main mission of the research group is to generate new knowledge to improve the implementation of innovation and entrepreneurial processes in companies and the strategic management of organisations. This knowledge is generated through three ways:
- Innovation: development and implementation of innovation and entrepreneurship management techniques and tools, encompassing the entire life cycle process of innovation.
- Organisation of work contexts that favour the alignment of people with the Strategy.

Thus, the Entrepreneurship and Innovation research group develops research activities in:
- Innovation and Technology Management: it focuses on the research on innovation processes and projects, portfolios, research in innovation
management tools and techniques (IMTs) and research in business models and innovation networks. This research aims to enable SMEs to develop more efficient innovation processes and to convert their business models into proposals of greater added value (individually or in networks). This is achieved through the systematisation of innovation activities, portfolio management, development of new business models, configuration of value constellations and collaborative models, as well as the use of techniques and tools adapted to the characteristics, sectors and specific innovation objectives of organisations.

- Entrepreneurship: based on the phenomenon of the Entrepreneurial University, this area focuses its research on the entrepreneurial processes in organisations (their models, objectives and processes to be implemented), as well as on the university-company collaboration, which helps companies, universities and other agents in the development of entrepreneurial activities within an ecosystem of innovation (Triple Helix).

- Industrial Organisation: The objective of this area is to respond to the challenge of “liberating” and aligning the potential of people for the benefit of a common project, with the aim of contributing to the sustainability/competitiveness of organisations. The research is based on an internationally contrasted model and has a database of 72,000 surveys of 510 organisations from various sectors (industry, education, services, etc.) that enables us to understand, among other aspects: (i) how to create work/organisational contexts that favour the alignment of people with the organisation’s challenges, and (ii) the extent to which people influence organisational performance.

Modelling of complex management systems: This scope of research seeks the modelling of complex management processes from a systemic vision. To do this, different simulation techniques are used (discrete event simulation, system dynamics-based simulation and agent-based models). The current areas of application focus on the management of people in organisations, business models, innovation networks, socio-technical systems, and corporate entrepreneurship systems.

**DISEINU BERRRIKUNTZA ZENTROA**

The Diseinu Berrikuntza Zentroa (DBZ) of MU-HPS brings together research and development activities related to the field of People-Centred Design. The DBZ aims to integrate human factors in the innovation and development processes, such as behaviour, needs, aspirations, and skills of people. Thus, the DBZ has developed its own people-centred innovation methodology, which allows the participation of different agents (users, customers, suppliers) in all phases of the innovation process. To do this, the methodology provides a series of specific tools for each phase of the process.

The main activities of the DBZ are:

- To design and implement processes of innovation and product/service development based on the people-centre design methodology. Additionally, to incorporate the human factor in innovation processes that entail a strong technical and technological nature.

- To understand the human factors that have an impact on the human-machine interaction and usability (HMI), with a clear focus on industrial contexts. Additionally, to develop studies that analyse their technological acceptance.

- To understand and integrate the key factors of inclusion and diversity in the processes of innovation and development of products and services. This is done with an emphasis especially on the concept of “aging.”
To support companies in servitisation processes, providing tools and methodologies and generating service concepts that add value to existing products.

To align the design with the strategy of the company, integrating design features in a consistent manner throughout its value proposition.

**PRODUCTIVE LOGISTICS OPERATIONS MANAGEMENT**

The increasing competitiveness forces companies to search for distinctive elements that provide them with competitive advantages at the product service level and from the standpoint of management. Framed in the Business Strategy, Operations Management is critical in this context, when responding to the needs of the client. Defined as the company function that plans, manages and controls the organisation’s resources in order to ensure its correct working order in accordance with the Service Strategy, it implies the coherent integration of the information and material flows through the entire productive and distribution system.

- **Project Management**: The study and improvement of project management in different contexts are addressed through the main existing approaches, mainly PMBOK®, Critical Chain, and Agile Project Management.
- **Manufacturing Engineering**: It focuses on industrial processes, through the study of the design of plant distributions, which is aimed at Lean Production by means of related techniques, such as VSM, OEE, cell design, SMED, SS, Smart Manufacturing, etc.
- **Industrial Asset Management**: Starting from the premise that the state and conservation of industrial means and facilities are a strategic activity to support a competitive production system, the main lines of action are the design and optimisation of operational techniques (Corrective, Preventive and Autonomous Maintenance, etc.), organisational aspects in Maintenance Management, TPM, or RCM.
- **Robust Industrialisation**: The industrialisation of processes in the service life is addressed based on the conception of the product until the end of its service life. The most frequently addressed key aspects are product reliability, reduction of variability through the 6-sigma method, modelling and optimisation, and data processing. The process for obtaining the CE marking, both in machines and in sanitary products, highlighting the design and development of a risk assessment system for the product or machine (ISO 14971, ISO 12100) and the implementation of a management system for quality (ISO 9001, ISO 13485), occupational safety (ISO 45001) or the environment (ISO 14001) are complementary aspects of special interest that are part of this area.
- **Supply Chain Management**: The main objective is to identify, visualise and study the key agents of the supply chain, in order to improve the flow of materials and information. The subjects addressed in this area are the following: Lean Logistics, process simulation, distribution network design, Demand-Driven MRP, and TOC-DBR.

**SOFTWARE AND SYSTEMS ENGINEERING**

Cyber-physical systems are complex systems, with computing and communication capabilities related to physical objects, being able to work together to form distributed and fully autonomous ecosystems. These types of systems are allowing innovation in many sectors such as Smart Cities, Smart Buildings, Smart Homes, and Smart Factories. Our research focuses on different aspects of software development and systems, from the initial stages of development to operation and maintenance. We apply our knowledge in the development and methodologies of software and systems in complex, distributed and highly configurable cyber-physical systems that require a
multidisciplinary approach and interoperability in development and operation.
· The Software and Systems Engineering research group focuses its research activity in three areas:
  · Development industrialisation: We address variability and configurability in highly configurable systems, integration of development tools and co-simulation for multidisciplinary systems and development methodologies, with a special emphasis on validation throughout the development.
  · Web engineering: This area investigates the Semantic Web technologies and the linked data structures from the standpoint of open systems (open source and open data) as well as in the design, development of interoperable platforms based on Web services and compliance with standards, and the construction of SOA architectures, which make possible complex and heterogeneous integration, multiplatform and multi-device systems.
  · Real-time distributed systems: We specialise in reliability, predictability, and control optimisation. This research takes into account all components of a distributed system such as communications, middleware, and the operating system.

ROBOTICS AND AUTOMATION

The Robotics and Automation research group investigates theories and techniques applied to adaptive, flexible, scalable and efficient production systems, in terms of both costs and energy consumption. The know-how of the team is articulated in three key technologies: Robotics and Artificial Vision.

  · Flexible and Collaborative Robotics: This term defines a new generation of industrial robots with cognitive capacity to make decisions and provide the robot with flexibility in its operation and is able to cooperate with humans by sharing physical space, without the security restrictions required in typical industrial robotics applications. In summary, the new robotics is characterised, among other things, by its flexibility, accessibility, and relative ease of programming.
  · Artificial vision: Due to its cross-sectional nature, artificial vision, or image processing, is a key technology for the development of Industry 4.0. As a ‘production eye’, artificial vision enables a more flexible production, enabling the control of the production flow through the inspection of the piece. This, in turn, allows for rapid production changes even in small production batches. Techniques such as pairing and 3D vision allow for more flexible gripping and assembly processes or rapid 3D models for additive manufacturing processes. IN turn, identification technologies (e.g. barcode and data reading, OCR) help control production processes more flexibly. Vision is also essential for a secure iteration between collaborative and human robots. The 3D technologies allow robots to “see” their human co-worker. To conclude, we highlight that the image processing makes it possible to add visual information to augmented or virtual reality devices.

DATA ANALYSIS AND CYBERSECURITY

The digitisation of the plant, both in the manufacturing and production processes, as well as of other auxiliaries (maintenance, procurement, logistics, etc.) aims at greater automation and optimisation based on the management and exploitation of the data. The aim of the research group is to generate knowledge related to smart processes, learning algorithms, optimisation of industrial processes, and information security, and to transfer it to the industrial fabric.

It works on the following lines of research and knowledge areas:

  · Information Security: The objective of this line of research is to face the new challenges posed in the most recent developments and uses of information technologies, providing solutions to improve the confidence of citizens in the New ICT landscape through safe and reliable technology research. Our research group contributes to areas such as: security in Industrial Control Systems (SCADA,
critical infrastructures), security (and privacy) in the cloud, security in social networks, security of embedded systems, or security in mobile devices and networks.

- **Data analysis:** This line of research focuses on adapting and applying the most advanced learning algorithms to diverse problems found in the society and industry. More specifically, projects are developed for areas such as advanced manufacturing, industrial processes, computer security, and health.

**SIGNAL THEORY AND COMMUNICATIONS**

The research and transfer projects of this research group focus on the design and implementation of signal processing systems applied to the following areas: communications, both wireless and wired, system monitoring, and inspection in industrial processes.

- **Communications:** The key technologies that are being investigated in wireless communications are fundamentally modulations and robust MAC layers for use in industrial environments. The use of Cognitive Radio and multi-antennae, or MiMO, systems are important examples of these technologies. The group’s results stand out due to their practical approach and, especially, their ability to implement these structures in FPGA-SOC and DSP. As a practical application of wireless communications to industrial environments, work has been carried out on the design and implementation of monitoring systems based on passive wireless sensors.

- **Monitoring and inspection:** The group also applies signal processing techniques in the field of identification, monitoring, and inspection of component systems and processes. The advanced inspection systems developed are applied in both the industrial and biomedical field. Highlights include the developments in in-factory inspection methods and the integration of sensors in components, operating generally in hostile environments.

- **Real-time implementation of signal processing systems:** Thanks to the group’s broad experience in implementing algorithms and complex systems in microprocessors and FPGAs, the group has specialised in the design and implementation of real-time systems for the fields of communications, energy, sensorisation, and process control. These implementations are tackled from low-level to high-level tools based on graphic tools.
SCIENTIFIC PUBLICATIONS

>> ARTICLES PUBLISHED IN JOURNALS INDEXED IN THE JOURNAL CITATION REPORT (JCR):

- **α-Case formation in Ti-6Al-4V investment casting using ZrSiO4 and Al2O3 moulds**
  X. Chamorro, N. Herrero-Dorca, P.P. Rodríguez, U. Andrés, Z. Azpilgain
  DOI: http://dx.doi.org/10.1016/j.matprotec.2016.12.007

- **A Methodology for Model-based Verification of Safety Contracts and Performance Requirements**
  Elena Gómez-Martínez, Ricardo J. Rodríguez, Clara Benac Earley, Leire Etxeberria Elorza and Miren Illarramendi Rezabal
  DOI: https://doi.org/10.1177/1748006X16667328

- **Advances in material and friction data for modelling of metal machining**
  Shreyes N. Melkote, Wit Grzesik, Jose Outeiro, Joel Rech, Volker Schulze, Helini Attia, Pedro-J. Arrazola, Rachid Saoubi, Joseba Mendiguren, Matthias Weiss
  DOI: https://doi.org/10.1016/j.cirp.2017.05.002

- **An analytical model for web-warping in variable width flexible: roll forming**
  Jingsi Jiao, Bernard Rolfe, Joseba Mendiguren, Matthias Weiss
  DOI http://dx.doi.org/10.1007/s00170-015-8191-y

- **An useful analytical formula to avoid thermal damage in the adaptive control of dry surface grinding**
  J. L. González-Santander, R. Fernández, C. Martín, P. J. Arrazola
  DOI http://dx.doi.org/10.1016/j.ijmecsci.2016.08.014

- **Automatic generation of test system instances for configurable cyber-physical systems**
  Aitor Arrieta, Goiuria Sagardui, Leire Etxeberria, Justyna Zander
  Software Quality Journal. Vol 25,nº3, Pg 1041–1083
  DOI http://dx.doi.org/10.1007/s11219-016-9341-7

- **Dynamic characterisation and modelling of the orthotropic self-reinforced polypropylene used in alternative FMLs**
  J. Iriondo, L. Aretxabaleta, A. Aizpuru
  DOI: http://dx.doi.org/10.1016/j.compstruct.2016.06.049

- **Effect of thickness on the maximum potential drop of current collectors**
  Jose Miguel Campillo-Robles, Xabier Artetxe, Karmele del Teso Sánchez

- **Effect of thermal annealing on machining induced residual stresses in Inconel 718**

- **Equivalence of primary control strategies for AC and DC microgrids**
  Eneko Unamuno, Jon Andoni Barrena
  Energies. Vol. 10, nº1, 2017. DOI:http://dx.doi.org/10.3390/en10010091

- **Influence of the pressure dependent coefficient of friction on deep drawing springback predictions**
  Imanol Gil, Lander Galdos, Joseba Mendigun, Endika Mugarra, Eneko Saenz de Argandoña
  DOI: http://dx.doi.org/10.1016/j.triboint.2016.07.004

- **Influence of oxygen content on the machinability of Ti-6Al-4V alloy**
  Irantzu Sacristan, Ainara Garay, Exabier Hormaetxe, Javier Aperribay, Pedro J. Arrazola
  DOI: http://dx.doi.org/10.1007/s00170-015-8317-2

- **Low-complexity cyclostationary-based modulation classifying algorithm**
  Pedro M. Rodriguez, Zaloa Fernandez, Raul Torrego, Aitor Lizeaga, Mikel Mendiguren, Iñaki Val
· Mass diffusion and thermal diffusivity of the decane-pentane mixture under high pressure as a ground-based study for SCCO project
  Ion Lizarraga, Cédric Giraudet, Fabrizio Croccolo, M. Mounir Bou-Ali, Henri Bataller
  http://dx.doi.org/10.1007/s12217-016-9506-9

· Mechanical characterization and modelling of Inconel 718 material behavior for machining process assessment
  DOI: http://dx.doi.org/10.1016/j.msea.2016.11.054

· On Cost-effective Reuse of Components in the Design of Complex Reconfigurable Systems
  J. I. Aizpurua, Y. Papadopoulos, E. Muxika, F. Chiacchio, G. Manno
  Quality and Reliability Engineering International, January, 2017
  DOI: http://dx.doi.org/10.1002/qre.2112

· Power Electronics Based DC Distribution Systems for Electrically Propelled Vessels: A multivariable Modeling Approach for Design and Analysis
  Argiñe Alacano, Juan José Valera, Gonzalo Abad and Pedro Izurza
  IEEE Journal of Emerging and Selected Topics in Power Electronics. Vol 5, nº4, pg 1604-1620. DOI: http://dx.doi.org/10.1109/JESTPE.2017.2730855

· Quality control by infrared thermography of the infusion manufacturing process of composite automotive specimens
  P. Venegas, I. Ortiz de Mendibil, A. Montero, J. Aurrekoetxea
  Quantitative InfraRed Thermography Journal. Pg. 1-13. Published online 21 Jun, 2017 DOI: http://dx.doi.org/10.1080/17686733.20171342322

· Receptance based structural modification in a simple brake-clutch model for squeal noise suppression
  Ondiz Zarraga, Ibai Ulacia, José Manuel Abete, Huaijiang Ouyang
  DOI: http://dx.doi.org/10.1016/j.jmsp.2016.12.028

· Reduction of noise milling operations
  J. Rech, F. Dumont, A. Le Bot, P. J. Arrazola
  CIRP Journal of Manufacturing Science and Technology, Vol 18, og 39-44, August 2017
  DOI: https://doi.org/10.1016/j.cirmj.2016.09.001

· Robustness of inventory replenishment and customer selection policies for the dynamic and stochastic inventory-routing problem
  Raul F. Roldan, Rosa Basagoiti, Leandro C. Coelho
  DOI: http://dx.doi.org/10.1016/j.cor.2016.04.004

· Soret coefficient of the n-dodecane-n-hexane binary mixture under high pressure
  I. Lizarraga, F. Croccolo, H. Bataller, M. Mounir Bou-Ali

· Spot welding monitoring system based on fuzzy classification and deep learning
  Ander Muniategui, Borja Hériz, Luka Eciolaza, Mikel Ayuso, Amaia Iturrioz, Ion Quintana, Pedro Álvarez
  DOI: http://dx.doi.org/10.1109/FUZZ-IEEE.2017.8015618

· The effects of corporate social responsibility on customer loyalty : the mediating effect of reputation in cooperative banks versus commercial banks in the Basque Country
  Izaskun Agirre Aramburu, Irune Gómez Pescador
  DOI: http://dx.doi.org/10.1007/s10551-017-3438-1

· Thermodiffusion Coefficients of Water/Ethanol Mixtures for Low Water Mass
  E. Lapeira, M. M. Bou-Ali, J. A. Madariaga, C. Santamaría
  DOI: http://dx.doi.org/10.1007/s12217-016-9508-7

· Thermodiffusion, molecular diffusion and Soret coefficients of aromatic+n-alkane binary mixtures
  Miren Larrañaga, M. Mounir Bou-Ali, Estela Lapeira, Ion Lizarraga and Carlos Santamaria
  DOI: http://dx.doi.org/10.1063/1.4964298
- Transport properties of the binary mixtures of the three organic liquids toluene, methanol, and cyclohexane

>> BOOKS

- Power electronics and electric drives for traction applications.
  Gonzalo Abad (editor).
  DOI: https://doi.org/10.1002/9781118954454

>> BOOK CHAPTERS

- Control of grid-connected converters
  Aritz Milicua and Gonzalo Abad
  En Power Electronics and Electric Drives for Traction Applications.
  DOI: http://dx.doi.org/10.1002/9781118954454.ch4

- Electric and hybrid vehicles
  David Garrido and Gonzalo Abad
  En Power Electronics and Electric Drives for Traction Applications.
  DOI: http://dx.doi.org/10.1002/9781118954454.ch7

- FPGA-Based Cognitive Radio Platform with Reconfigurable Front-End and Antenna
  Aitor Arriola, Pedro Manuel Rodríguez, Raúl Torrego, Félix Casado, Zaloa Fernández, Mikel Mendicute, Eñaut Muxika, Juan Ignacio Sancho, Iñaki Val
  ISBN 9783319496788 (Print), 978331949679-5 (Online).
  DOI: http://dx.doi.org/10.1007/978-3-319-49679-5_9

- Hybrid AC/DC microgrid mode-adaptive controls
  Eneko Unamuno, Jon Andoni Barrena
  DOI: http://dx.doi.org/10.5772/intechopen.69026
RELEVANT DATA

Academic Year 2016-2017

Students of Training Courses in Higher Education 250
Undergraduate Students 1,295
Master’s Degree Students 268
Doctorate students 105
Students in International Mobility 237
Hours of Continuous Training 9,521
R&TD Budget (1) 12,525
Support Budget (1) 30,694
Ordinary Investment (1) 1,485
Staff 491

(1) Thousand Euro

GENERAL AND MULTI-DISCIPLINARY SERVICES

One of the current challenges of MGEP is the efficient and sustainable planning and management of the services offered to the university community. To achieve sustainable services, which meet the needs and expectations of different users, we implemented strategies and proposals during the academic year 2016-2017 through the following projects:

· Design and development of new Web services and content: The CRAI (Centre for Learning and Research Resources) Library considers its digital presence to be strategic. For this reason, and aware of the high number of visits on the CRAI Library website, it has made a great effort in the design and development of new Web services and content, as well as working on customising the Web experience for each collective of the university.

· Advice on issues of intellectual property: The CRAI Library continues with the line of advisory work on issues of intellectual property at the institution. In this academic year, it has oriented its work to the teaching activity by offering, in coordination with the Rector’s Office and General Coordination, training modules for teachers throughout the University.

· Development of a Business Intelligence tool: The CRAI Library worked on the development of a Business Intelligence tool to automate the process of obtaining data and statistics of the bibliographic production resulting from the research activity of the School.
· Project IKT2020: Within the strategic reflection of MU, a strategic line related to digitalisation was identified, with three strategic objectives:
  -- To develop infrastructure and common digital tools for the management of university activity and development of an integrated information system.
  -- To develop infrastructure and common digital tools for learning.
  -- To develop the Campus M Digital Ecosystem.
In this project, the necessary actions were analysed, designed and planned to achieve these strategic objectives proposed for 2020 in collaboration with the four schools and MU. The first results will be seen in the academic year 2017-2018.

· Renewal of computer equipment: In Information Systems, an important investment in systems was made and the server infrastructure was renewed. Thus, we will achieve greater performance in terms of processing speed and access to network services. In turn, by reducing the physical number of servers, we reduce energy consumption. Currently, compared to years ago, we obtain greater computing capacity with fewer physical machines.

· Configuration of the EDUROAM network: This configuration made in Information Systems allows students, researchers and staff of the participating institutions to have Internet connectivity through their own campus and when they visit other participating institutions. It is the global safe mobility service developed for the academic and research community.

· Adaptation of buildings: With the collaboration of Building Management, the update of the building licence for building 1 was obtained. Additionally, the necessary adjustments were made to update the building licence for building 2.

· Building 11: The construction project of the two pending floors of building 11 was completed. The total rating of building 11 will be completed following completion of works during the academic year 2017-2018.

· Energy audit: The energy audit was carried out according to Royal Decree 56/2016, from which various improvement actions were taken in the buildings.

· Design and implementation of ISO 17025: In the field of quality, work was carried out on the design and implementation of the ISO 17025:2005 standard for the materials laboratory, obtaining the accreditation of ENAC (National Accreditation Entity) in February 2017.

· Implementation of the UNIFIKAS computer application: For the management of occupational risk prevention, work was carried out on the implementation of the UNIFIKAS computer application. Additionally, work is being carried out on the integration with other management applications such as personnel, machines and access to living quarters and laboratories.

· Mobile application of Mondragon Unibertsitatea Konet: All cross-sectional services are collaborating in the Campus M project and in the implementation of new services in the Konet app.

· New ERP (Enterprise Resource Planning): In order to optimise business processes and improve access to information and the possibility of sharing information among all workers of the organisation, the search and analysis of a new ERP was initiated, to be implemented in the academic year 2017-2018.
**BITERI HALL OF RESIDENCE (CMB)**

The Mondragon Higher Polytechnic School offers its accommodation and maintenance service to the students of Mondragon Unibertsitatea. During the academic year 2016-2017, a total of 119 students enrolled in this institution. Specifically, those enrolled for the first time were 99, with 13 renovations and 7 short-term foreign students.

We should highlight the importance of the groups of foreign students who choose Mondragon Unibertsitatea to complete their corresponding studies since their stay at the Hall of Residence enriches coexistence and represents an opportunity to open up about other realities and cultures for the native university students. During the academic year 2016-2017, the following groups visited us:

- **September-October:** 28 Mexican students for a 3-week stay.
- **September-January:** 8 Mexican students for a 5-month stay.
- **September-October:** 22 French students for a 1-month stay.
- **May:** 19 Central American students for a 3-week stay.
- **June-July:** 35 Mexican students for a 3-week stay.

On the other hand, we should not lose sight of the mission of this institution when we refer to it as a Hall of Residence. The aim is to complement the academic training of students in search of their integrity as people. The experience acquired through the relationship with the students and, by extension, their families, teaches that the three agents of direct influence with the training process share two basic objectives:

- The student should be trained satisfactorily.
- The students should enjoy an enlightening university experience.

For this purpose, the Hall of Residence is organised in work groups, with responsibilities being shared among the students. These duties are monitored by the staff of the centre through group and individual tutor meetings.

Another highlight is the increasingly implied academic relationship that the Biteri Hall of Residence is gaining in the university community, as verified below.

**>> ACTIVITIES RELATED TO FORMAL EDUCATION:**

The academic year 2016-2017 was the fifth consecutive year in which the Biteri Hall of Residence has contributed with its knowledge in group activities to collaborate in the subject of Methodological Foundations taught in the mechanics degree, in both Arrasate and Goierrri, through a module relating to the development of teamwork, designed by the professionals of the centre.

In addition, Biteri has participated in the pilot experience for the development of an academic tutoring programme to be implemented in the course and improve the monitoring of university students. Twenty mechanics students were monitored, with 8 teachers appointed to execute the pilot experience and collaborate with the team. The result was satisfactory according to the student surveys.

**>> ACTIVITIES RELATED TO NON-FORMAL EDUCATION:**

The space for extra-academic activities is progressively gaining strength as a valid, fun and efficient training environment. 85% of the total credits requested by the students were accredited by Biteri (72 of 85). In this regard, it should be noted that 7 non-college students applied and obtained their respective credits.

The list of extra-academic activities is as follows:

**Charity Area**

- Charity football at the Ibaiondo educational centre.
- Volunteer work at the Harrera Gela of the Arrasate Public School.
Haima: direct solidarity action in the Urgatzi centre for minors.
- Haima txiki: school reinforcement for children from migrant families.
- Collaboration with the San Juan de Dios Hospital.
- Three blood donation sessions.
- Volunteer work at the Ibaiondo educational centre.
- Volunteer work in Elkarhezitzen.

Sociocultural Area

- Course start field trip in Beizama.
- Sports meeting between the State Halls of Residence in Madrid.
- Leisure and sport outings: skiing, paintball.
- Organisation of fancy dress competition and outing to the Tolosa carnivals.
- Cultural visit at Astarbe Sagardotegi.
- Bertso Afaria and chocolate party.
- Talks:
  - “The clown as knowledge of oneself”, Ana Eguiazabal.
  - “Euskal encounter and you”, Sabino San Vicente.
  - “The surfing culture”, Karmele del Teso.
  - “Mexico, from a socioeconomic perspective”, Mexican student.
  - “The global economy”, Fernando Murgiondo.
- Internal and external communication of Biteri’s activities.
- To learn how to knit to make winter clothes.
- Development of technology projects in a multidisciplinary way from the commission “Makers”.
- Design and manufacture of drift trikes.

Student representation area

- Coordination of the working order and in-house activities.
- Representatives of the different committees take part in the decision-making alongside the director of the Hall of Residence through the College Council.
- Organisation of the Academic Year Opening Ceremony.

Sport and Healthcare Area:

- Training and participation in skating races.
- Monthly outings to see the Basque mountains.
- Training and participation in popular races.
- Integral personal care and health.
- Internal sport championships.
- Mus championship between CCMM of the Basque Country.
- Coordination with those responsible for the restoration service in order to improve the students’ diet and the service.
- Internal organisation of the emergencies team.

>> ACTIVITIES RELATED TO INFORMAL EDUCATION:

To grow, taking responsibility, is what makes a person feel an active part of and owner of their personal development. There is, however, another equally important component, which has to do with the bonds established by people. In this sense, Biteri aims to build a university community where students feel first accompanied and then become active parts of it. The aim is to ensure that each member of the university, working as a team and assuming cooperative values, becomes a player in said community.
EXTRACURRICULAR ACTIVITIES

The aim of the sport service is to promote an active lifestyle among students and the staff, providing facilities and offering the possibility of performing various physical and sport activities. In addition to the activities themselves, the sport department works on various projects to provide a better product and communication with the entire group of students and staff via a computer system that facilitates their enrolment in activities. It sets up collaboration agreements with the various sport organisations in the area to provide access for the students and staff to their facilities and programmes.

During the academic year 2016-2017, 666 students participated in the following activities (without taking into account the 300 participants of the health week activities, in which there were no registrations):

>> COMPETITIONS

In the various official championships organised: internally at the School, inter-school, in the Basque Country and at the state level, the participation was of 382 students. Similarly, a total of 42 students competed in other tournaments and international championships such as: Karting, Surf, Herri Kirolak and Zabalki (international pelota match).

>> PROMOTION OF SPORT ACTIVITIES AND HEALTH

137 people participated in:

A) COURSES AND OUTINGS

Different courses and outings were proposed in which the students had the opportunity to learn new sports or practice the known ones. Courses such as surfing, rock climbing, canoeing, karting and skiing were organised with the participation of a total of 126 students.

B) IMPROVING PHYSICAL FITNESS

In this section, students enrolled in gyms, both public and private, were taken into account to carry out physical activities whilst taking advantage of our agreements with these centres, with a total of 11 students enrolled.

>> RENTING FACILITIES AND BORROWING EQUIPMENT

This service, which allows students and staff to carry out their preferred activities at their own pace, was widely accepted, with 84 people making a reservation or borrowing equipment.

>> ADDITIONAL ACTIVITIES

This section includes all activities related to physical activity that do not involve a practice itself, such as the visit to the sport teams Baskonia, Elbar SD, and Real Sociedad, various photography and jersey design contests, etc., where 276 students participated.
It should be noted that more than 300 students participated in the activities that were organised for health week, an amount that has not been added to the overall indicators for the service due to the fact that registration in the sports department for these activities was not necessary, thus making it impossible to tell if these people participated in other activities or not.

>> WORKER PARTICIPATION

The sport service has encouraged workers in the School to practice sport, adapting activities to the available time in their timetables. Thus, during the academic year 2016-2017, 89 workers participated in the activities organised (72 participated as workers and 17, as MUkide, i.e. alumni).

SOCIAL AND MANAGEMENT BODIES

>> GENERAL ASSEMBLY

The General Assembly is held for the members to discuss and reach agreements on matters within their powers and it is chaired by the President of the Governing Board. It is constituted by 232 labour partners, 232 user partners (students), and 232 collaborating partners (companies).

>> GOVERNING BOARD

The Governing Board is the collegiate body responsible for managing and representing the Cooperative.
- President: Juan Mª Palencia
- Vice-President: Mª Asunción Sarriónandia
- Secretary: Idoia Irazabal
- Spokespersons:
  - José Antonio Alustiza
  - Egoitz Arruti
  - Erik Aranguiz
  - Gonzalo Bueno
  - Carmelo Cortabarria
  - José Antonio De Frutos
  - Mikel Mendikute
  - Martín Oxoa de Eribe
  - Amaya San Martín

>> GENERAL COORDINATION

This is the body responsible for coordinating the school’s activities and businesses, taking on leadership and responsibility for the MGEIP project and advising the Governing Board.
- General Coordinator:
  - Carlos García
- Academic Coordinator:
  - Nekane Errasti
- Professional Training Coordinator:
  - Gorka Aretxaga
- Research Coordinator:
  - Roberto Uribeetxeberia
- Continued Training Coordinator:
  - Gentzane Aldekoa
- Electronics and Computing Coordinator:
  - Xabier Sagarna
- Mechanics and Industrial Production Coordinator:
  - Xabier Arrasate
- Cross-Sectional Systems and Services Coordinator:
  - José Luis Larraíbe
- Financial Coordinator:
  - Milagros Arregui

>> SUPERVISORY COMMISSION

The Supervisory Commission is the body responsible for the duties of review and control of the cooperative.
- Germán Albistegui
- Belén Cortabarria
- Aitzol Pico

>> SOCIAL COUNCIL

The Social Council is the body that represents the partners and working partners and has information, advice and consultancy as its basic functions.
- Gonzalo Abad
- Andrea Aginagalde
- Javier Arkauz
- Igor Azkarate
- Haritz Barrutia
- Nagore Elexpuru
- Mikel García
- Ander Goikoetxea
- Aitor Orue
- Elisabeth Urrutia
- Obdulia Vélez
- Iñigo Zendegi
COLLABORATING COMPANIES AND INSTITUTIONS

COLLABORATING PARTNERS:

- ABEKI COMPOSITES, S. L.
- ALECO, S. COOP
- ALEJANDRO ALTUNA, S. A.
- AUSOLAN, S. COOP.
- ASMOBI, S. L.
- COPRECI, S. COOP.
- EKIDE, S. L.
- ENERGÍA PORTÁTIL, S.A.
- FAGOR AOTEK, S.COOP.
- FAGOR ARRASATE, S. COOP.
- FAGOR, S.COOP.
- FAGOR AUTOMATION, S. COOP
- FAGOR EDERLAN, S. COOP
- FAGOR ELECTRÓNICA, S. COOP.
- FAGOR INDUSTRIAL, S. COOP.
- FUNDACIÓN GIZABIDEA
- GALLASTEGUI Y CIA, S. A.
- GOIZPER, S. COOP.
- IDEKO, S. COOP.
- IKERLAN, S. COOP.
- LABORAL KUTXA, S.COOP.
- LANA, S.COOP.
- LKS, S. COOP.
- LKS INGENIERIA, S.COOP.
- MONDRAGON, S.COOP.
- MONDRAGON ASSEMBLY, S. COOP.
- ULMA AGRÍCOLA, S.COOP.
- ULMA CONVEYOR COMPONENTS, S.COOP.
- ULMA C Y E, S. COOP.
- ULMA EMBEDDED SOLUTIONS, S.COOP.
- ULMA FORJA, S. COOP.
- ULMA HORMIGÓN POLÍMERO, S. COOP.
- ULMA MANUTENCIÓN, S. COOP.
- ULMA PACKAGING, S.COOP.
- ULMA PACKAGING TECHNOLOGICAL CENTER, S.COOP.
- ULMA SAFE HANDLING EQUIPMENT, S.COOP.
- ULMA SERVISIOS DE MANUTENCIÓN, S.COOP.
- GRUPO ULMA

COLLABORATING PUBLIC INSTITUTIONS:

- MONDRAGON TOWN HALL

- GUIPUZCOA DISTRICT COUNCIL
  - Department of Innovation, Rural Development and Tourism.

- BASQUE GOVERNMENT
  - Department of Education.
  - Department of Economic Development and Infrastructure.
  - Department of Employment and Social Policies.

- CENTRAL GOVERNMENT
  - Ministry of Economy, Industry and Competitiveness.

- EC: EUROPEAN COMMISSION