PHD PROGRAMME TABLE 37TH CYCLE

Section "Available Positions and Scholarship" integrated on 22/04/2021

Section "Available Positions and Scholarship" modified on 29/04/2021

Section "Available Positions and Scholarship" integrated on 06/05/2021

Section "Available Positions and Scholarship" corrected on 19/05/2021

Section "Available Positions and Scholarship" integrated on 08/06/2021

Section "Available Positions and Scholarship" integrated on 11/06/2021

PROGRAMME'S NAME	**HEALTH AND TECHNOLOGIES**
DURATION	3 years
PROGRAMME START DATE	01/11/2021
LANGUAGE	Italian, English
MANDATORY STAY ABROAD	3 months
COORDINATOR	Prof. Marco Viceconti (marco.viceconti@unibo.it)
CURRICULA	N/A
RESEARCH TOPICS	Detailed list at the bottom of the present document
PhD POSITIONS	24
ADMISSION PROCEDURE	Qualifications and research proposal evaluation Oral examination

Available Positions and Scholarships

Pos. n.	Financial support	Description	Positions linked to research topics
1	PhD Scholarship	Totally funded by the University of Bologna general budget	Dedicated to the development of a research topic chosen by the candidate among those listed at the end of this document
2	PhD Scholarship	Totally funded by the University of Bologna general budget	Dedicated to the development of a research topic chosen by the candidate among those listed at the end of this document
3	PhD Scholarship	Totally funded by the University of Bologna general budget	Dedicated to the development of a research topic chosen by the candidate among those listed at the end of this document
4	PhD Scholarship	Totally funded by the University of Bologna general budget	Dedicated to the development of a research topic chosen by the candidate among those listed at the end of this document
5	PhD Scholarship	Totally funded by the University of Bologna general budget	Dedicated to the development of a research topic chosen by the candidate among those listed at the end of this document
6	PhD Scholarship	Totally funded by the University of Bologna general budget	Dedicated to the development of a research topic chosen by the candidate among those listed at the end of this document
7	PhD Scholarship	Funded by the University of Bologna general budget and co-funded by the Department of Industrial Engineering	Dedicated to the development of a research topic chosen by the candidate among those listed at the end of this document

8	PhD Scholarship	Funded by the the Department of Industrial Engineering with funds made available by the project H2020_ISW_DIN - H2020 ISW "In Silico World: Lowering barriers to ubiquitous adoption of In Silico Trials" – G.A. 101016503. Resp: Prof Marco Viceconti	Development of orthopaedic treatment models for in silico trials
9	PhD Scholarship	Funded by IMA - Industrie Macchine Automatiche S.p.A.	Biological estimate of safe packaging through 3D-bioprinted models
10	PhD Scholarship	Funded by IMA - Industrie Macchine Automatiche S.p.A.	Development of novel point of care devices for communicable and non-communicable diseases
11	PhD Scholarship	Funded by Pietro Galliani S.p.A.	Application of noble metals for health protection
12	PhD Scholarship	Funded by the Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi" with funds made available by the project PR19-RR-P1: TwinMED – Ampliamento delle Funzionalità dell'Esoscheletro Twin nel contesto Clinico/Riabilitativo" (P.I. Prof. Lorenzo Chiari)	Modeling the dynamics of a rehabilitative exoskeleton enhanced with instrumented crutches: system design and clinical validation
13	PhD Scholarship	Funded by the Department of Industrial Engineering with funds made available by the project INAIL PR19-CR-P5 – OsteoCustom "Processi personalizzati di trattamento dell'amputazione mediante osteointegrazione" - P.I. Prof. Luca Cristofolini	Biomechanical rationale and testing custtomized femoral prosthetic component for amputees
14	PhD Scholarship	Funded by the Department of Industrial Engineering with funds made available by the project INAIL PR19-CR-P5 – OsteoCustom "Processi personalizzati di trattamento dell'amputazione mediante osteointegrazione" - P.I. Prof. Luca Cristofolini	Anatomical-based design of customized femoral prosthetic components for amputees
15	PhD Scholarship	Funded by the Department of Industrial Engineering with funds made available by the project INAIL PR19-CR-P5 – OsteoCustom "Processi personalizzati di trattamento dell'amputazione mediante osteointegrazione" – P.I. Prof. Luca Cristofolini, and by the project H2020_ISW_DIN - H2020 ISW "In Silico World: Lowering barriers to ubiquitous adoption of In Silico Trials" (G.A. 101016503) P.I. Prof. Marco Viceconti	Biomechanical and clinical evidences of vertebral metastases to predicct the risk of fracture
16	Intersectoral PhD position	Position reserved for employees of the Istituto Scientifico Romagnolo per lo Studio e la Cura dei Tumori "Dino Amadori" (IRST) S.r.l., IRCCS	Topics of interest of the relevant institution
17	Intersectoral PhD position	Position reserved for employees of the Istituto Scientifico Romagnolo per lo Studio e la Cura dei Tumori "Dino Amadori" (IRST) S.r.l., IRCCS	Topics of interest of the relevant institution

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18	Intersectoral PhD position	Position reserved for employees of Azienda USL della Romagna	Topics of interest of the relevant institution
19	Industrial PhD position	Position reserved for employees of Humanitas S.p.A.	Topics of interest of the relevant company
20	PhD Scholarship	Funded by AOSP Azienda Ospedaliero universitaria di Bologna	Biomechanics, neuro-cognitive systems, diagnostic technologies, therapeutic technologies, predictive medicine, medical devices and services
21	Intersectoral PhD position	Position reserved for employees of Azienda Provinciale per i Servizi Sanitari – Provincia Autonoma di Trento	Topics of interest of the relevant institution
22	PhD Scholarship	Funded within the Research training projects "Big Data per una regione europea più ecologica, digitale e resiliente" (Fondo POR FSE – Resolution n. 752 of 24/05/2021)	Use and reuse of Big Biomedical Multi-Omics Data (genomics, medical imaging and histopathology) to assist and optimize clinical decisions
23	PhD Scholarship	Funded by Centro Alma Human AI and co-funded by the Department of Experimental, Diagnostic and Specialty Medicine	AI and Statistical learning methods for Genomics data generated by EU projects HARMONY, HARMONY-PLUS and GenoMed4All
24	PhD Scholarship	Funded by Centro Alma Human AI and co-funded by the Department of Experimental, Diagnostic and Specialty Medicine	AI and Statistical learning methods for Genomics data generated by EU projects HARMONY, HARMONY-PLUS and GenoMed4All

Admission Exams

	DATE AND TIME	RESULTS
Qualifications and research proposal evaluation	Applicants' participation is not required	Available from **15/06/2021****
Oral examination	Time: starting from **19/06/2021 – 10 a.m. CEST*** **Place**: Remotely, using Microsoft Teams	Available from **07/07/2021****

* In case that the oral examination cannot be completed in one day due to the large number of applicants, the oral examination detailed schedule shall be made available on the webpage Studenti Online together with the results of the qualifications evaluation.

During the oral examination applicants may express their interest in the position linked to a specific research topic, under the condition that their research proposal is coherent with the topic-specific scholarship.

** The results of the admission exams will be available on the webpage Studenti Online (select "summary of the requests in progress" → "see detail" and open the .pdf file at the bottom of the page. **No personal written communication will be sent to applicants concerning the examinations results.**

Required and Supporting Documents to be attached to the Application

(only documents in Italian, English, French, German and Spanish shall be considered as valid and be assessed by the Admission Board)

Only qualifications obtained during the last 5 calendar years shall be taken into consideration, except for the University Degree. The Admission Board will assess the relevance of the supporting documents to the PhD Programme.

REQUIRED DOCUMENTS	
Identity document	Valid identity document with photo (i.e. identity card, passport)
Curriculum Vitae	The Europass format is required

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Degrees	Documents attesting the awarding of the first and second cycle degrees, the exams taken and the marks obtained (see Art. 3 of the Call for Applications)
Research proposal	Multi-annual research proposal, with special emphasis on the activities to be completed during the first-year course. The proposal must meet the following requirements: - It **must** mention on the cover page the **title of the research topic**, from the list at the bottom of the present document, of the PhD Programme the applicant is interested in and that covers the research project proposal. - it **cannot exceed 20,000 characters**, including spaces and formulas, if present. This figure does not include: the title, the outline, references and images (such as graphs, diagrams, tables etc - where present); - It must include: the state of the art; description of the project; expected results; lead-time for implementation; outline of the proposed findings assessment criteria references.

SUPPORTING DOCUMENTS

Thesis Abstract	Abstract of the **second cycle degree thesis**. Applicants who are yet to obtain their second cycle degree may submit the draft of their thesis (abstracts cannot exceed 5,000 characters, including spaces and formulas, if present. The above figure does not include: title, outline, images such as graphs, diagrams, tables etc. if present).
Reference Letter/s	**No more than 2 reference letters** signed by **Italian and/or International academics and professionals** in the research field, which do not form part of the Admission Board, attesting the suitability of the applicant and his/her interest for the scientific research. Letters shall be uploaded following the procedure on Studenti Online, detailed in the Call for Applications (Art. 3.2).
Personal Statement	The statement shall include the **reasons prompting the applicant to attend the PhD Programme** and those relevant experiences and research interests, that make the applicant suitable for the specific PhD Programme (3000 characters maximum, including spaces).
Publications	Lists of publications (i.e. monographs, articles on scientific journals), minor publications (conference papers, volume's chapters etc.), abstracts and posters presented during national and international conferences, etc.
Other documents	- University Master Courses (Master Universitari di I e II livello) - Postgraduate vocational training programmes and/or specialisation programmes relevant to the PhD Programme - Specialisation thesis abstract (max 1500 characters) - Teaching activity carried out at university level - Research activity - whether basic, applied, translational, etc. - carried out in any capacity, including when covered by research grants, and as a staff member of research units

Evaluation Criteria*

Scores will be expressed in points out of 100, as follows.

1. **Qualifications evaluation**

Minimum score for admission to the oral examination: 30 points, Maximum score: 50 points

Qualifications evaluation	University degree final mark. Graduands shall be evaluated according to the Weighted Average Mark (WAM).	7 points max
	Publications	4 points max
	Thesis Abstract	1 point max
	Reference Letter/s	1 point max
	Research activity, including when covered by research grants, and as a staff member of research units	3 points max
	Interdisciplinarity and balance between technical and clinical scope	6 points max
	Periods of study/research abroad	3 points max
	Other titles regarded as relevant by the Admission Board	3 points max
Research proposal evaluation	Scientific value and innovative nature of the proposal	18 points max
	Description and structure of the proposal	2 points max
	Proposal feasibility	2 points max

2. **Oral examination**

Minimum score for eligibility: 30 points, Maximum score 50 points

English proficiency	10 points max
Research proposal presentation	20 points max
General knowledge of issues encompassed by the PhD Programme	20 points max

The oral examination includes the presentation of the research proposal and is intended to assess the suitability of the applicant for scientific research as well as the general knowledge of issues encompassed by the PhD Programme (see the list of research topics at the bottom of the present document). During the oral examination, the Admission Board will assess the applicant's proficiency in the English language. **The oral examination is carried out in Italian and/or in English**.

*Possible further evaluation criteria will be available on the University website, selecting the relevant PhD Programme → "More information", at the bottom of the page in the section "Notices".

Final Ranking List and Enrollment

After the publication of the results of the oral examination, the final ranking list will be available on the University website, selecting the relevant PhD Programme → "More information", section "Notices" at the bottom of the page.

Considering the expressions of interest for the **topic-specific position**, the Admission Board will establish if the applicants can be considered eligible for the allocation of the positions linked to specific research subjects, considering their skills, experience and aptitude. The positions with scholarships linked to specific research subjects will be awarded on the basis of the eligibility stated by the Admission Board, and of the sub-ranking generated by each specific research subject. Should one or more of the abovementioned positions remain vacant, eligible applicants from the general ranking list may be contacted.

Following the publication of the final ranking list, successful applicants shall enroll on Studenti Online by the deadline indicated on the University website, selecting the relevant PhD Programme → "More information". If a successful applicant withdraws from a position, the following applicant in the ranking list, who is also eligible for the specific position, will be contacted. During the replacement procedure, the new terms of enrollment shall be communicated via e-mail to the chosen applicant.

Research Topics avaible for the positions 1-7

Topic	Subject	Title	Description
A	Medico / Biologico	Design of synthetic 3D scaffolds for skeletal muscle tissue differentiation	Loss of skeletal muscle and waste of its function are caused by trauma, aging, surgical procedure or by genetic disease leading to deterioration of movements and in the most severe cases to complete paralysis and death. Despite skeletal muscle has good regenerative capacity due to the presence of resident stem cells this ability has not been yet investigated from a clinical setting in the field of regenerative medicine. Studies demonstrated that cells can be transplanted into muscle resulting in a repopulation of the stem cell niche. Cell-based tissue engineering is recognized as one of the most promising tools among new therapeutic approaches for muscle tissue regeneration. This technique overcomes limitations shown by the use of cell-based therapies and 2D cultures by reproducing a 3D structure, scaffold or organoid, mimicking the native tissue. An ideal 3D scaffold guarantees the maintenance, adhesion and cell proliferation as well as the tissue development.
B	Med / Bio	The role of gender differences in tissue biophysical properties in	Women are more likely than men to develop disability after hip osteoarthritis (OA), and with it experience greater losses of physical function and disability. The estimated prevalence of strictly symptomatic hip OA in older population (over 60 years of age) is 8% in female patients and 7% in male patients. However, the self-reported

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		osteoarthritis progression	prevalence is very different between the two sexes: in the same age group the prevalence is 12% in females and 7% in male patients. This would suggest that there is a gender difference in how the physiology handles joint overloading. Two of the possible causes that can explain this gender difference in prevalence of primary OA are anatomical neuromuscular differences or biophysical differences of the tissues involved. This project is aimed at exploring this latter hypothesis.
C	Med / Bio	Effect of neurodegenerative comorbidities on the risk of revision of knee joint replacements	The level of biomechanical loading acting daily on a joint replacement is determinant of many of the clinical failure modes (wear, aseptic loosening, dislocation, etc.). There is experimental and theoretical evidence which shows that degradation of neuromuscular control, typical of neurodegenerative disorders, increases the biomechanical loading on the joints during normal motor tasks of daily living. Therefore, it is reasonable to expect that the outcome of joint replacement procedures should be affected by the presence of neurodegenerative co-morbidities. A recent observational study (Bottle, 2019) confirms this hypothesis for Parkinson's Disease (PD); however, the topic poses a number of important research questions, especially with regard to the mechanical consequences of neuromuscular degeneration, and its effects on implant failure. The aim of this project is to explore this relation using epidemiology and biomechanics methods.
D	Med / Bio	Development of a Time-to-Positivity (Tpos) Assay as a Tool for Monitoring Antibiotic Therapy of Gram-Negative Infections in Patients with Sepsis	Bacterial sepsis is a leading cause of death in intensive care units (ICUs) with one-third of patients never receiving timely adequate antimicrobial therapy. This project will utilize automatic blood culture systems already available in clinical microbiology laboratories to develop a validated "Time-to-positivity" (Tpos) assay for measuring bactericidal activity of patient's serum. Our hypothesis is that the time taken for a standardised bacterial inoculum to "grow through" the antimicrobial effect provided by the patient's serum sample collected during antibiotic treatment can serve as a surrogate pharmacodynamic index for predicting antibiotic efficacy. Hence, a short Tpos (i.e. < 10 hours) would provide an early indication that a patient is receiving an inadequate antimicrobial treatment regimen and should prompt therapy modification to improve patient outcome.
E	Med / Bio or Engineering /Technical	Development of new in vitro models to evaluate drug absorption and metabolism	The development of new drugs is characterized by a long and very expensive multistep process with a large failure, potentially exposing patients to possible health risk related to side effects and pharmacological interaction during the registration trials. Traditional in vitro models (monolayer cells) do not strictly represent the complex kinetic of drugs in human tissues. On the other side, animal models are progressively considered unethical and, one more time, not always strictly representative of human physiology and pathophysiology. In this context, the development of new in vitro models reproducing the histological structure and functional activity of tissues are strongly needed, both to improve prediction of drug effects in humans, to plan more targeted clinical trials, and to improve the selection of more bioavailable and safe drugs and drug-association to be clinical developed. This could be particularly useful to evaluate the absorption and metabolism of new and old (combined) drugs, especially in liver, bowel and lung tissues.
F	Med / Bio or Engineering /Technical	Cold plasmas for closed environment sanitation	The Covid-19 pandemic, caused by the SARS-CoV-2 virus, has put into evidence the importance of indoor air quality control and its depuration. This proposal for a Doctoral Programme is focused on the development of devices based on non- thermal plasmas (NTPs) to control and reduce aerosol transport and aerosol infectivity of airborne

			pathogens in air. The reference air flows pertain to air recirculation in indoor environments inhabited by humans, such as rooms, offices, factories and public transportation. The project's goals will include the construction of a small-scale test facility, where different plasma modules will be mounted. The plasma modules will feature different electrode arrangements and applied voltages. The effectiveness of the proposed technique against viruses and bacteria will be assessed. The experimental activity will be complemented with a modelling activity of the plasma production and action.
G	Med / Bio or Engineering /Technical	Fall risk assessment leveraging new technologies	Fall prevention is of paramount importance given the global dimension of population aging. It starts with categorizing people according to their fall risk to allow primary and secondary prevention and proper treatment and assistance. Several risk assessment tools have been developed, typically based on simple clinical tests (e.g., Timed Up and Go Test). Recent advances in fall risk assessment research suggest that more can be done to prevent falls and better stratify risk. E.g., by using wearable sensors during real-life activities, we could augment accuracy in fall risk assessment. State-of- the-art is represented by few small studies of limited data quality. The candidate will plan and design a clinical study to gather prospective high- quality data. Also, existing datasets will be explored. Data will have to be processed, leveraging state-of-the-art and innovative algorithms. The candidate will develop and validate a new system for automatic fall risk assessment, considering its effective implementability and public health deployment.
H	Med / Bio or Engineering /Technical	Machine Learning for kidney transplantation optimization and outcome prediction (AI4Kidney)	AI4Kidney aims to optimize kidney transplantations by using an Artificial Intelligence and Statistical Learning and survival statistics methods, in order to predict their outcomes, and to build new prediction models of graft survival taking into account of immunological factors, as well as known recipient and donor variables. The visionary idea is to emulate the nephrologist ability to extract information on diagnosis, prognosis, and therapy responsiveness from native or transplant kidney biopsies and other clinical variables. Of course, this approach is not intended to provide a tool capable to substitute the MDs, instead, the idea is to provide a solid, quantitative and standardized instrument that will help the nephrologist in the decision making process. The final product will be a Clinical Decision Support System for kidney transplantation, that can pave the way also for application in other field of surgery/transplantations.
I	Engineering /Technical	Developing imaging biomarkers from contrast-enhanced CT images of hepatocellular carcinoma predicting the microvascular invasion (MVI) using clinical and radiomic features	Microvascular invasion is one of the primal causes of recurrence after surgical treatment of Hepatocellular Carcinoma (HCC). However, the preoperative detection of MVI is very difficult, this causing pitfalls in the surgical decision making and leading to useless liver transplantations. Some imaging tumour findings may suggest the presence of MVI, including tumour size and morphology of tumour margins, but none of them is accurately related to the histologic proof achieved post-surgery. Therefore, new detection and prognostic approaches are needed for improving the pre-operative detection of MVI and increasing the benefits of treatment options. To this purpose, medical image phenotyping, recently called "Radiomics", has shown to be effective to extract imaging biomarkers, by analysing a high number of features through machine learning methods. This project aims at detecting imaging biomarkers by setting up retrospective studies on cohorts of patients from S.Orsola-Malpighi Hospital (SOH) to select most promising radiomic features among those conceived by the Computer Vision

			Group (CVG) of DISI, to be subsequently validated with prospective studies. Finally, the reproducibility of biomarkers is assessed with a multicentre study, also involving the collaborating hospitals.
J	Engineering /Technical	Design, development and functional characterization of Cold PLASMA systems to reduce airborne transmission of Hospital Acquired Infections & COVID-19.	Bioaerosols have become an important topic in daily life because they are associated with a wide range of diseases, for instance, influenza, allergies, and respiratory syndromes. The airborne transmission is considered the most likely mechanism explaining the diffusion of nosocomial infections and more recently the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In this regard, in recent years many scientific works emphasized the importance of Heating, Ventilation and Air Conditioning Systems (HVAC) in the transmission/spreading of infectious diseases especially in hospitals or other healthcare facilities. Conventional treatments aimed at killing microorganisms are always prone to the development of resistances; it is estimated that by 2050, 10 million people could die per year caused by multidrug-resistant bacteria. This project will focus on the study of an innovative treatment of bioaerosol containing bacteria and viruses using cold atmospheric pressure plasmas (CAPs). Indeed, CAP, with its blend of reactive oxygen and nitrogen species (RONS), UV ray and electric fields is known to be used for the inactivation of microbes. Thus, the use of CAP could be a novel and safe adjuvant strategy for the containment of indoor airborne transmission of different types of pathogens.
K	Engineering /Technical	Biomechanical evaluation of knee mechanical behaviour and interface stresses with a new concept of alignment for total knee arthroplasty (NEW-KNEE)	At least one knee replacement out of 5 are dissatisfactory due to continuous pain. This is mainly related to inadequate joint kinematics with the current paradigm for prosthesis alignment, causing painful patellar motions and poor balance of soft tissue. Recently, a different rationale has been proposed based on kinematical alignment (KA). This PhD student will work under the joint supervision of an orthopaedic surgeon focusing on knee replacement, and of two engineers with a background in biomechanical in vitro testing, and numerical modelling respectively. During these three years, the PhD student will develop a numerical to estimate how the knee joint loads are affected by implant positioning, and a series of in vitro tests to measure how this affects the implant-bone interaction.
L	Engineering /Technical	Artificial intelligence and augmented reality for the automated co-registration of 3D virtual models to guide robotic radical prostatectomy and partial nephrectomy	3D virtual models obtained from processing of multiparametric magnetic resonance imaging (mpMRI) and computerized tomography (CT) imaging have been proposed as innovative aids for urological surgery, particularly for renal and prostatic surgery. 3D models are useful to guide the surgeon during crucial surgical steps. Recent research activities to improve 3D-guided robotic surgery focus on the development of augmented reality (AR) systems able to visualize 3D virtual models in the surgical field with in vivo co-registration during robotic surgery. The 3D model does not follow automatically the real organ during its mobilization and traction during surgery. Thus, this non-automated AR may increase the surgical time due to the need of several re-adjustments of the 3D model over the surgical field. The aim of the project is to design, develop, test and validate an artificial intelligence(AI)-based AR system able to automatically co-register in real time the 3D model and the surgical field.
M	Engineering /Technical	Development of a Novel Computational Framework to gain Mechanistic Insights on Atrial	Atrial fibrillation (AF) is the most common arrhythmia, causing substantial morbidity and mortality. AF is often treated with catheter ablation, but its success rates remain low because the mechanisms underlying the arrhythmia are incompletely understood. Recent observations promise to lead to better outcomes: a) atrial fibrosis and its location correlate with the ablation responsiveness b) AF is

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		Fibrillation and inform Ablation Strategies	maintained by electrical rotors/drivers and targeting their suppression improves the success rates. However, the lack of a rigorous mechanistic framework of AF pathophysiology limits the value of those studies, which are still debated. This project aims to provide such a framework by exploiting advanced bioengineering concepts. AF mechanisms will be first analysed in AF patient data, acquired with state-of-the-art instrumentation. Data will be integrated within a multi-scale personalized computational model of the atrium, providing an in-silico environment for personalized ablation planning.
N	Engineering /Technical	Elastomers with tunable degradation as small diameter blood vessel substitutes for peripheral artery disease	The research project aims to develop a small diameter (< 6 mm) synthetic vascular graft suited for arterial revascularization in patients with peripheral arterial disease (PAD) and critical limb ischemia (CLI). To allow limb savage and prevent vascular death, open surgery bypass revascularization using autologous vein grafts is the gold standard. When it is not possible, any other approach gives unsatisfactory result. Therefore, developing a tunable synthetic vascular prosthesis made up of new or modified elastomers represents a possible solution. The graft will be composed by a nanofibrous scaffold of elastomers with controlled hydrolysable properties; the scaffold will be biocompatible and will present a fast degrading internal portion and a slow degrading external part for blood contention; a non-thrombogenic surface will be established through plasma ionized gases technology; thanks to its controlled hydrolysable properties a rapid graft integration with human blood and vascular cells will be achieved. The small diameter synthetic vascular grafts should be able to substitute the autologous vein when donor site morbidity and limited autograft availability occur.
O	Engineering /Technical	In silico trials for predicting the risk of failure in joint replacements in patients with neurodegenerative co-morbidities	Among the risk factors associated to total knee replacements failure are gait abnormalities and instabilities, usually caused by the presence of neurodegenerative diseases, such as Parkinson's Disease, or diabetic neuropathy. In silico trials can be used to simulate movement disorder patterns, and also predict the risk of occurrence for most common failures modes and prevent the adverse outcomes. By combining these modelling efforts, it should be possible to estimate the increase in risk of failure associated to specific failure modes (massive wear, aseptic loosening, etc.) due to the presence of a neurodegenerative comorbidity. The aim of this project is to develop patient-specific and disease-specific models that can systematically explore the effect of these comorbidities on the risk of failure of joint replacements, as a first step toward a more personalised management of these patients.