VERBALE DEL CONSIGLIO
DELLA SCUOLA DI DOTTORATO DEL POLITECNICO DI BARI

Seduta n. 2/2020 ***del giorno 3 marzo 2020***

Il giorno 3 marzo 2020 alle ore 16:00, a seguito di convocazione del 25/02/2020, si è riunito presso l'ufficio del direttore della SCUDO al secondo piano della sezione Macchine ed Energetica del DMMM il Consiglio della Scuola di Dottorato del Politecnico di Bari, per discutere il seguente

ORDINE DEL GIORNO

1. Comunicazioni del Direttore.
2. Offerta didattica della Scuola.
3. Organizzazione della Cerimonia di consegna dei diplomi per il XXXII ciclo.

Sono presenti:

	PROF			Presente	Assente giustif.	Assente
1	PROF.	**DE PALMA**	**Pietro**	**X**		
2	PROF.	**DEMELIO**	**Giuseppe Pompeo**		**X**	
3	PROF.	**DOTOLI**	**Mariagrazia**	**X**		
4	PROF.	**GIGLIETTO**	**Nicola**		**X**	
5	PROF.	**GRIECO**	**Alfredo**	**X**		
6	PROF.	**MASTRORILLI**	**Pietro**		**X**	
7	PROF.	**MOCCIA**	**Carlo**		**X**	
8	PROF.	**MOSSA**	**Michele**	**X**		
9	PROF.	**PASCAZIO**	**Giuseppe**	**X**		
10	PROF.	**PICCIONI**	**Mario Daniele**	**X**		
11	DOTT.	**MOTTA ZANIN**	**Giulia**	**X**		

Alle ore 16:15, il direttore, accertata la presenza del numero legale dei componenti, dichiara aperti i lavori del Consiglio. Viene nominato segretario il prof. Alfredo Grieco.

P.1) Comunicazioni del Direttore

Il Direttore comunica che sono ancora in corso gli incontri tra i rappresentanti del Politecnico di Bari, dell'Università di Bari e dell'Università del Salento per istituire due nuovi corsi di dottorato che dovrebbero coinvolgere Università di Bari, Politecnico di Bari e Università del Salento per il settore Aerospazio, e Università di Bari e Politecnico di Bari per il settore Industria 4.0.
Le proposte per i due nuovi corsi di dottorati saranno presentate alla Regione Puglia, che deve verificare l'interesse ed accettare di cofinanziarle, e in seguito dovranno essere presentate al

Ministero. Contemporaneamente si sta verificando la possibilità di ulteriori collaborazioni su due corsi di dottorato.

Il Direttore comunica che il Politecnico di Bari, su richiesta del Presidente dell'Accademia Pugliese delle Scienze, ha concesso il patrocinio alla manifestazione "3 anni in 3 minuti". Si tratta di una:

"Competizione Regionale tra neo Dottori di Ricerca, che abbiano conseguito il titolo negli anni 2019 e 2020, e Dottorandi, che lo conseguiranno entro il 2020, provenienti dalle Scuole di Dottorato delle Università della Regione Puglia, per premiare le 10 migliori Conferenze che illustrino i risultati originali della loro Tesi di Dottorato in un tempo massimo di 3 minuti.

La Competizione è patrocinata da tutte le Università pubbliche pugliesi.

Ciascun Candidato potrà scegliere di competere in una e una sola delle seguenti Aree Tematiche:

- *Scienze Applicate,*
- *Scienze di Base,*
- *Scienze Economico-Giuridiche,*
- *Scienze Mediche e della Vita,*
- *Scienze Umanistiche.*

I Candidati dovranno partecipare a una preselezione inviando una presentazione power point o un video della durata massima di 3 minuti che sarà visionato dalla Commissione esaminatrice.

La Commissione, appositamente costituita dall'Accademia Pugliese delle Scienze ed eventualmente integrata da Docenti delle Scuole di Dottorato afferenti alle Aree Tematiche menzionate, selezionerà le presentazioni migliori e inviterà i Candidati selezionati ad effettuare verbalmente la presentazione del proprio lavoro di Tesi, utilizzando il supporto eventuale di un power point che sia diverso da quello inviato per la preselezione e che contenga materiale proprio e non soggetto a copyright, con esclusione di animazioni, suoni, musiche e filmati presi dal web.

Il taglio delle Conferenze deve essere scientificamente rigoroso e allo stesso tempo tale da poter essere apprezzato da un pubblico quanto più possibile vasto. Il Concorrente che superi i 3 minuti è automaticamente escluso.

L'obiettivo della Competizione è esercitare i giovani ricercatori a comunicare in maniera semplice e chiara le finalità della propria ricerca, sia negli aspetti di base che delle possibili applicazioni.

Ai vincitori sarà consegnato un Attestato di Merito e inoltre un *extended abstract* del loro lavoro di Tesi di Dottorato sarà pubblicato senza oneri in un volume speciale degli "Atti e Relazioni" dell'Accademia Pugliese delle Scienze.

La premiazione avrà luogo durante una manifestazione pubblica, con la partecipazione delle massime autorità Accademiche, Universitarie e Regionali, in cui i vincitori presenteranno i risultati della propria Tesi in massimo 3 minuti a un ampio auditorio.

Chi intende partecipare alla Competizione deve inviare ***dall' 1 al 14 aprile 2020*** un power point o un video della lunghezza massima 3 minuti ed un breve abstract del proprio lavoro di Tesi (2000 caratteri), all'indirizzo accademia.pugliese@uniba.it con una email avente Oggetto "3A3M-Area Tematica…." (specificare l'Area Tematica prescelta).

Il Direttore comunica che "il MIUR destina un ammontare di risorse pari a € 10.000.000,00 a borse di studio aggiuntive aventi ad oggetto la tematica: "Ambiti di innovazione e di consolidamento della Strategia nazionale per le Aree interne: dai servizi essenziali (scuola, sanità e mobilità)
e dai progetti di sviluppo locale alle Strategie per le aree marginalizzate". Tali borse saranno finanziate nell'ambito dell'Avviso "Dottorati Innovativi con caratterizzazione industriale",
XXXVI ciclo, quale misura addizionale alle borse di studio aggiuntive finanziate dal MIUR.

Le borse di dottorato aggiuntive finanziate a valere sull'Avviso riferito al XXXVI ciclo, riguarderanno, quindi, sia aree disciplinari e tematiche coerenti con le traiettorie di sviluppo individuate dalla Strategia Nazionale di Specializzazione Intelligente 2014-2020 sia, attraverso le risorse addizionali di cui al presente Avviso di preinformativa, tematiche afferenti alla Strategia Nazionale per le aree interne." Inoltre, "80% pari a € 8.000.000,00 saranno destinati alle Università la cui sede principale è ubicata nelle regioni del Mezzogiorno (Abruzzo, Basilicata, Calabria, Campania, Molise, Puglia, Sardegna e Sicilia)".

P.2) Offerta didattica della Scuola

Offerta didattica 2019-2020

In attuazione di quanto già deliberato nel Consiglio del 28 giugno 2019, ricevuti i programmi degli insegnamenti afferenti al DICAR, il Consiglio delibera di bandire al più presto i seguenti insegnamenti nell'ambito dell'offerta didattica relativa **all'A.A. 2019-2020**:

1. Theories and methods of design for the Antique, 3 CFU, SSD: ICAR/14.

Syllabus:
The course is divided into two parts, corresponding to the two blocks of lessons and exercises.
The first part (20 hours, 2 ECTS) will be structured into four thematic sections: the first, by investigating the contributions offered by the Masters of Architecture between the XIX° and XX° centuries and deducing their theoretical background, will try to outline the general principles underlying the main points of view that connote contemporary architectural research; the other three will be thematically articulated and focused on the relationships between "Antique and Landscape", "Antique and City", "Renovation and Museography", and will see the compositional analysis of some exemplary contemporary works, in order to recognize methods and techniques of the design for the Antique.
The second part (10 hours, 1 ECTS) will be devoted to the exercises. They will be carried out in the modality of an intensive design workshop, dealing with and developing a project concerning the main topics of the course.

2. Theory of Contemporary Architectural Research, 3 CFU, SSD: ICAR/14.

Syllabus:
It seems lost today, in architecture as generally in arts, an unitary point of view on which to found a theory on. That civil conscience that has always been the basis of the art of building seems no longer part of the collective heritage. This condition is recognizable in the contradictory experience of contemporary architecture.
For this reason the class aims to try to outline a "classical" theory of architectural research; a classicism that does not renounce, rather it investigates, the culture of modernity, trying to measures itself against this alleged contradiction. All the architecture that we can include within the "classic" experience (that we can also define "rational experience") is characterized by a peculiarity: the intelligibility of forms, along with we define a method of formativeness.
According to this idea of architecture, there's no advancement of forms without an advancement of knowledge - without an increasingly higher level of self-awareness. Hence the need for a theory of architectural research.
The method of formativeness we want to investigate regards three major chapters of architecture:
The relationship among architecture, city and landscape;
The "construction issue";
The question of the project with the Ancient.

3. Theories and Methods of the Project for the City, 3 CFU 3, SSD: ICAR/14.

Syllabus:

The course is divided into two parts, corresponding to the phases of lessons and exercises.
The first part of the course (20 hours, 2 credits) will deal with issues related to the city as a historical- aesthetic palimpsest, interpreted as a synthesis of an approach that is both documentary and transformative, based on the relationship between physical form and "cognitive form".
The second part (10 hours, 1 credit) will instead focus on issues relating to the processes and methods of urban interpretation and modification throughout history, focusing especially on those that have appeared since the twentieth century, with their multiple problems.
In this sense, various themes will be central, such as that of the "diachronic relationship" within the general urban processes, the theme of the narrative function of their inheritance, and finally the theme of the consequent theoretical and methodological choices, developed -in different ways- in the main researches of Italian and international contemporaneity (from the "organic vision" proposed by the first Roman and then Muratorian schools, to the phenomenological-cognitivist one proposed by the various Italian and American schools already in the second half of the 1900s, to the analytical- structuralist research of the successive neo-rationalist tendencies, up to the most recent ones, which experience the "dialectical contradiction" as a tool through which to reformulate the figurative heritage in relation to the unprecedented condition of the contemporary city).
This phase will be carried out through an intensive urban design workshop, based on the critical exercise of the main themes developed during the course.

4. Theories and Methods of the Project for the Territory, 3 CFU, SSD: ICAR/21.

Syllabus:

The course is divided into 2 steps, corresponding to the 2 blocks of lessons and exercises.
The firs tstep (20 hours, 2 ECTS) will be structured in 4 thematic sections: the first will deal with general questions on the main approaches to the contemporary territories regarding a discipline that is found between the epistemological model of scientific disciplines and that of Social Sciences; the other 3 lessons will focus on the topics that are at the heart of the contemporary disciplinary debate (as well as in the PhD course in "Project for Heritage: Knowledge and Innovation"), relating to the relationship between" City and Landscape "and" Architecture and Heritage ".
The second step (10 hours, 1 ECTS) will be dedicated to exercises and seminars of teachers external to the course: the first will be conducted in the form of a workshop on sample territories on which to experiment an approach to contemporary issues (relationship between places and communities, territories palimpsest, territories in crisis…), developing a synthetic written-graphic report concerning the main topics of the course. A seminar held by an Italian or foreign external personality, with a relevant point of view on the topics of the course, will allow a wide reflection between PhD students and author on the topics covered.

5. Teorie e metodi del progetto per le strutture: modellazione e sperimentazione, 3 CFU, SSD: ICAR/08 – ICAR/09

Syllabus:

The shape of masonry constructions and the influence of the curvature in the load bearing capacity of arches, domes and vaults. Seismic actions and masonry constructions.
Mechanical behavior of masonry: heterogeneity, different behavior in tension / compression, non-linear mechanical response, anisotropy, failure modes, damage.
Modeling strategies: micromechanical models, FEM and DEM implementation of micromechanical models, macromechanical models, multiscale models, NT (No-Tension) and RNT (Rigid No-Tension) models, macro-elements.
Limit Analysis: static and kinematic approaches. From the static approach of Limit Analysis to the relation between shape and structures in masonry arches and vaults (and back to graphic statics).

Offerta didattica 2020-2021

Su invito del Direttore, i Coordinatori dei corsi di dottorato hanno effettuato un'indagine tra i colleghi del proprio Dipartimento per discutere e raccogliere proposte di insegnamenti al fine di configurare l'offerta formativa della Scuola di dottorato a partire dal prossimo anno accademico 2020-2021 (XXXVI ciclo). Sono pervenute 20 proposte dal DEI; 10 proposte dal DICAR; 10 proposte dal DICATECH; 16 proposte dal DMMM.
Il Consiglio, in generale, ritiene di organizzare l'offerta didattica su due anni in modo che non vi possa essere la ripetizione dello stesso insegnamento in due anni consecutivi. Per assicurare un'elevata qualità della didattica erogata e l'aggiornamento della stessa, tutti i corsi saranno valutati impiegando moduli di valutazione che dovranno essere compilati dagli studenti frequentanti. In base alla valutazione degli studenti e al numero di studenti frequentanti, il Consiglio potrà decidere in futuro le variazioni da apportare all'offerta didattica della Scuola.

Dopo ampia discussione, il Consiglio delibera di erogare 31 corsi per l'A. A. 2020-2021 (per un totale di 68 CFU).

L'elenco dei corsi da erogare nell'A. A. 2020-2021, e quindi da bandire per supplenza al più presto, è il seguente:

1. Conservation Laws in Continuum Mechanics and Traffic Modeling, 2 CFU, SSD: MAT/05.

Syllabus:
Introduction to Conservation Laws. Scalar conservation laws. Hyperbolic systems of conservation laws. Euler and Burgers equations. The Method of Characteristics. Semilinear equations with constant coefficients. Semilinear equations with variable coefficients. Quasilinear equations: creation of shock waves. Shock waves. Discontinuous solutions. Rankine-Hugoniot conditions. Shock waves. Entropies and entropy fluxes for scalar equations and systems. Entropy weak solutions. Liu conditions: entropic shock waves. Kruzkhov Theorem. Uniqueness and stability of entropy weak solutions. Change of coordinates. Oleinik Estimate. Oleinik estimate for conservation laws with convex fluxes. Uniqueness via Oleinik type estimates. Riemann Problem. Shock and rarefaction waves. Solution of the Riemann problem for convex fluxes. Solution of the Riemann problem for general fluxes. Vanishing Viscosity. Vanishing viscosity approximants. Viscous shock waves. Convergence and error estimate. Numerical schemes. Viscosity solutions for Hamilton-Jacobi equations. Legendre transform. Lax-Oleinik Formula. Traffic Models. Fluid-dynamic models for vehicular traffic. LWR model: shock and rarefaction waves. Aw-Rascle model. Two phase models. Multi-population models. Traffic on networks: shocks generated by the junctions. Continuum Mechanics. Nonlinear elasticity. Gas dynamics. The p-system. Shock waves. Riemann invariants.

2. Introduction to PDEs and Applications, 2 CFU, SSD: MAT/05.

Syllabus:
<u>Preliminary Calculus tools</u>

- Differential Calculus
- Function sequences and function series
    - Taylor Series
    - Power Series
    - Fourier Series

<u>Partial Differential Equations</u>

- Transport Equation
    - Physical model

    - Solving the initial value problem
    - Transport equation with damping
    - Transport equation with concentrated source
- Heat Equation
    - Linear diffusion model
    - Separation variables
    - Maximum principle
- Laplace Equation
    - Harmonic functions
    - Separation variables
    - Maximum principle
- Wave Equation
    - d'Alembert's formula
    - Vibrating string

3. Statistical Mechanics with Applications to Materials Science, 2 CFU, SSD: MAT/07.

Syllabus:
Introduction To Statistical Mechanics: Thermodynamics; equations of state; free energy and entropy; observables; ensembles; probability distribution; partition function in the canonical ensemble.
Phase Transitions: Ensembles of phase transitions; critical points; correlation functions; symmetry breaking and order parameter; Landau theory and mean field.
Models: Ising model: solution in one and two dimensions; Heisenberg model; random ferromagnets; polymers; liquid crystals.

4. Proportional and servo-valves: industrial state-of-the-art and research advancements, 2 CFU, SSD: ING-IND/08.

Syllabus:
This course will allow PhD students to improve their technical knowledge of Fluid Power, particularly of directional proportional valves and servo-valves, which are widely used in several industrial and aeronautical control systems demanding high precision and repeatability.
At the beginning, the course will briefly deal with the operating principles of volumetric pumps, volumetric motors and cylinders. Analytical formulas used to study these components will be introduced as well. Afterwards, the architectures of directional proportional valves and servo-valves will be described thoroughly. The implementation of these components into hydraulic systems employing volumetric pumps, volumetric motors and cylinders will be discussed in detail. Analytical formulas allowing the calculation of the flow rate, discharge coefficients, flow forces, etc., will be explained too. The students will also be introduced to advanced numerical simulation tools applied to these valves, such as Ansys Fluent and Simscape Fluids, and advanced experimental testing procedures used in industry and academia. Finally, current research investigations into these components will be presented, in particular research studies dealing with the fluid-dynamic optimization of proportional valves, cavitation in proportional valves, internal leakage in the main stage of servo-valves, squeeze film damping mechanism in the pilot stage of servo-valves, and novel servo-valve concepts using piezo-actuators.

5. Numerical Approaches to Solid and Applied Mechanics: Boundary Element Methods (BEM), 2 CFU, SSD: ING-IND/13.

Syllabus:
Theory of BEM (6 hours). Linearity and superposition principle: integral formulation of mechanical problems. Green's function. Translation Invariance. Solution schemes of the integral convolution: Fourier vs Real space. Adaptive mesh.

BEM Applications: Contact Mechanics (6 hours). BE methods for contact mechanics: formulation for linear elastic and viscoelastic materials, role of the geometric domain (smooth and rough contacts), meshing and solution schemes.Boundary Element (BE) vs Finite Element (FE) methodologies: advantages and drawbacks.
Coupling BEM And Other Numerical Methods (4 hours).Numerical coupling to study finite domains: BEM and FEM; BEM and molecular dynamics (MD). The case of soft lubrication: coupling BEM and finite difference (FD).
BEM Applications: Structural Mechanics (4 hours). BEM for modal analysis including fluid-structure interaction: the test case of the modal analysis for a beam immersed in a viscous fluid.

6. Application of Thermographic techniques to general problems in Mechanical Engineering, 2 CFU, SSD: ING-IND/14.

Syllabus:
1.Review of measurement of temperature related problems (2 hours): a. Contact measurements; b. Non contact measurement: pyrometers; c. Non contact measurement: Thermal cameras.
2. Performing Thermal measurements (6 hours): a. Instrumentations; b. Setup; c. Reflected temperature and emissivity issues.
3. Applications: a. Thermal methods in on Destructive testing (6 hours); b. Thermal methods applied in wind gallery (2 hours); c. Thermal methods for process monitoring (2 hours); d. Thermal methods for welding monitoring (2 hours).
Individual guided implementation of a typical setup for thermographic measurement

7. The Industry 4.0 Operator - Improving the Human Performance Envelope - Tools and Methods, 2 CFU, SSD: ING-IND/15.

Syllabus:
The course will be composed of 3 modulesaimingat providing Ph.D. students with the necessary knowledge to validate in their scientific research the effectiveness of solutions designed in order to improve the operator's performance with particular attention to the HPE.
Module I. Introduction and theoretical bases.The role of the Operator in the I4.0 smart factory. Introductionto the concept of HPE and its fundamental components —the physical and the cognitive workload.Basic principles of the Cognitive Load Theory.The ISO standard 11226 Ergonomics — Evaluation of static working postures.
Module II. Assessment methods for physicalergonomics. Post-hoc measures (the Borg-CR 10 scale), direct methods, observational methods(the Rapid Upper Limb Assessment metrics), innovative applications for the observational methods (the ErgoSentinel tool).
Module III. Assessment tools for cognitive ergonomics.Post-hoc measures (the NASA Task Load Index, the Multiple Resource Questionnaire), task performance measures (Completion time, Error Rate, reaction Time, the dual-task design); direct methods (the electrocardiographic signal and the Heart Rate Variability Analysis approach).

8. Innovative Materials and Processes for Large Science Experiments, 2 CFU, SSD: ING-IND/16.

Syllabus:
This multidisciplinary course intends to present new, relevant, and advanced topics within innovative materials science and engineering. This course explores the exiting relationships between the performance of mechanical, electrical, optical, and magnetic devices, and the material/technological characteristics used to construct them. Moreover, the design of the experiments and the development of real options are investigated to evaluate design flexibility. Emphasis is placed on evaluating real options with special attention given to efficient analysis and practical applications.

9. Lean Production in the Digital Factory, 2 CFU, SSD: ING-IND/17.

Syllabus:

1. Lean Production Elements (1 CFU).

Leanprinciples and Lean approach.

Quantitative methods for Cycle time analysis and losses evaluation in production systems.

Value Stream Mapping and Value Stream Design.

2. Continuous improvement of system performance (0,5 CFU).

Performance Measurement System (PMS).

Tree-like structure of Key Performance Indicators (KPIs) for manufacturing operations management (MOM).

IEC and ISO Standards for the digital factory.

3. Lean processes and the digital factory (0,5 CFU).

Lean Transformation: from Toyota Production System (TPS) to Industry 4.0.

Emerging Standards for data acquisition and data processing, Machine to machine communication (M2M), and Human-machine interaction (HMI).

10. Technology Entrepreneurship: Theory & Practice, 2 CFU, SSD: ING-IND/35.

Syllabus:

The present course aims at allowing PhD students to develop the ability for identifying and evaluating technology opportunities with commercial exploitation potential. Indeed, the course is designed to make PhD students able to understand the main arguments for translating their research outcomes into business ideas. Specific attention will be paid to the evaluation and definition of new technology-based business ideas, providing the students with theoretical and practical insights. Three main arguments will be discussed, as:

A) Business Modeling – this section aims at providing PhD students with the fundamental strategic and managerial issues of business evaluation, modeling, and definition, hence making them able to translate research ideas into business opportunities. Lessons will be based upon theory and actual cases' discussion.

B) Innovation Management– this section aims at providing PhD students with the basic concepts and methodologies to understand and analyze the strategic processes of firm's technological innovation in the attempt to make them able to manage innovation processes for generating and sustaining competitiveness. Particular attention will be paid to first mover advantage, collaboration strategies, intellectual property protection, and open innovation. Lessons will be based upon theory and actual cases' discussion.

C) Budgeting and Funding – this section aims at providing PhD students with the main approaches for designing and managing a financial strategy of the firm, thus making them able to economically sustain their business idea. Particular attention will be paid to the role of budget, investments' analysis, business angels, venture capitals, and crowdfunding. Moreover, this section provides PhD students with the basic concepts of risks and risk management as well as methodologies for evaluating investment opportunities in presence of uncertainties, such as Real Options Valuation. This would provide a better understating of the impact that uncertainties and risks characterizing future scenarios, meaning also opportunities, may have on business ideas, in the attempt to make PhD students able to proactively manage uncertainties, thus maximizing profit and reducing financial distress caused by uncertainties. Lessons will be based upon theory and actual cases' discussion.

11. Embedded system design, 2 CFU, SSD: ING-INF/01

Syllabus:

Theoretical part:

Introduction to embedded systems - definitions, general characteristics, fields of application

Overview of platforms and systems on the market

Hardware, firmware and software design flow
Deepening: SoC Nordic nRF52 series Bluetooth Low Energy - architecture and peripherals
Practical laboratory part:
IDE installation
nRF5 Software Development Kit (nRF SDK) choice, installation and usage
Peripheral management (BLE, GPIO, UART, IIC, SPI, PWM)
Examples for low-cost sensor and actuator management

12. Lab-on-chip devices, 2 CFU, SSD: ING-INF/01

Syllabus:
General introduction to Lab-on-chip devices.
Overview of biochemical assays and sequencing techniques.
Introduction to microfluidics.
Materials and fabrication techniques for integrated microsystems.
Electrochemical and photonic techniques for detection
LoC Applications.

13. Research Methodology, 2 CFU, SSD: ING-IND/31

Syllabus:
Research Theory
Ethics and Research
Research Methods and Instruments
Research Project
Case studies and examples where required

14. Antenna technology for 5G communications: propagation, arrays and integration, 2 CFU, SSD: ING-INF/02

Syllabus:
Introduction
Antenna elements and types
Implementation of antenna arrays using basic principles
Characterization and test of antenna and array performance
Radiopropagation, beam steering and beam forming for communication systems

15. Industry 4.0: Optimization, Control and Security, 2 CFU, SSD: ING-INF/04

Syllabus:
The course includes the following four main sections:
1) Industry 4.0 – Introduction and innovations for the industrial companies.
2) Cloud computing system: architecture and design.
3) Optimization and control in a Cloud computing system: centralized and decentralized optimization, multi-agent optimization (distributed task assignment, consensus, etc.), Programmable Logic Controller (PLC).
4) Opacity notion and algorithms to defend crucial information by intruder attacks.

16. Applications of MATLAB, 2 CFU, SSD: ING-INF/04

Syllabus:
Environment of the MATLAB Software
Predefined functions
Working with matrices
Graphical functions
Functions defined by the user

Inputs and outputs controlled by the user
Control structures and logical functions
Symbolic math
Modeling and simulation in Simulink

17. Optimization And Control Of Complex Systems, 2 CFU, SSD: ING-INF/04

Syllabus:
Non-linear optimization. Examples: resource distribution, task planning and scheduling problems.
Introduction to game theory. Connection of games theory with optimization and control.
Introduction to parallel and distributed computation. Parallelization and decomposition in optimization problems. Iterative methods for nonlinear problems.
Decision and control systems architecture: Centralized, Decentralized, Hierarchical and Distributed approach.
Decentralized optimization and control. Primal and dual decomposition. Motivating examples. Resource allocation in single and multi-period.
Hierarchical optimization and control. Multi-level programming. Motivating examples. Optimal planning for complex organizational structures in smart cities.
Distributed optimization and control for large-scale systems. Motivating examples. Scheduling and planning in networked control systems.

18. Reasoning on the Web of Data, 2 CFU, SSD: ING-INF/05

Syllabus:
Modeling and querying the Web of Data: RDF and SPARQL
Reasoning on the Web of data:
- Methods for cutting knowledge-relevant portions of linked data ensuring feasible reasoning solutions
- Definition of reasoning services in RDF

Inferring strategic knowledge from the Web of Data: examples of applications implementing reasoning services in RDF

19. Numerical Methods for Differential Equations, 2 CFU, SSD: MAT/08

Syllabus:
The course includes the following main sections:
1) Initial value problems (IVP) first-order equations; higher-order equations; systems of differential equations
2) Partial differential equations (PDE) the diffusion equation; the advection equation; the wave equation
3) Numerical methods: definition, description (convergence, stability, A-stability...), stiffness, implementation

20. Software tools for modeling optimization problems, 2 CFU, SSD: MAT/09

Syllabus:
Introduction to optimization modeling.
Optimization modeling software tools.
Modeling in Python: tools and case studies.
Advanced modeling techniques.

21. Multi-Criteria Approaches Applied To Multi-Risk Analysis, 2 CFU, SSD: ICAR/09-ICAR/10

Syllabus:

The proposed teaching program aims at preparing PhD students to face interdisciplinary multi-risk analysis by investigating Multi-Hazard, Vulnerability and Exposure through multicriteria decision methods (MCDM).
The program aims at providing an advanced understanding of multi-criteria analysis in order to set up a multi-risk algorithm and optimize mitigation strategies at different scales.
The course consists of:
- an introductory part on Slow Onset Disasters (SOD) and Rapid Onset Disasters (ROD);
- a module which explains the most used multi-criteria methods such as the Analytic Hierarchy Process (AHP), the Analytic Network Process (ANP) and the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS).
- practical exercises developed by each student on a case study regarding their personal research in which algorithms for risk assessment using MCDM are included.

22. Adaptive technologies for the Mitigation of Urban Heat Island and Climate Change Effects, 2 CFU, SSD: ICAR/10.

Syllabus:
The aim of the course is to provide students with the knowledge of the effects of climate change and Urban Heat Island (UHI) on built environment. The course will also provide detailed knowledge on the techniques and technologies to adapt the building fabrics to the effects of climate change and UHI and to counterbalance the temperature increase. The first part of the course will explore in detail the major issues of urban climatology, helping in defining the interaction between environmental variables, outdoor surfaces and building fabrics. In the second part of the course detailed students will investigate in detail adaptive technologies to mitigate the temperature effects of climate change-related phenomena. Examples from successful real case studies will be shown. Finally, the third part of the course will provide students with a hands-on experience of modelling techniques and tools to simulate the thermal characteristics of cities and buildings and assess the impact of adaptation technologies. The assessment will be based on the modelling of a selected case study and on the analysis of the effects of different adaptation technologies.

23. Spatial planning and design matters via applied ontology, 3 CFU, SSD: ICAR/20.

Syllabus:
The course has three main aims: 1) to introduce the student to the applied ontology modeling perspective and its methodologies, 2) to present knowledge tools based on applied ontology, and 3) to acquire practical experience in problem modeling and solving in planning and design. The first aim (applied ontology perspective) is achieved by presenting the state of the art in foundational ontology, the basic distinctions on which it relies, and principles of knowledge organization. The second aim (knowledge tools) is achieved by presenting dedicated software (e.g. Protege) and languages (e.g. OWL) and practicing their use in simple scenarios and in problems of knowledge integration. The third aim (practical experience) is based on hands-on practice session in which the students will model and solve simple planning and design problems. An orthogonal theme that is discussed across all the course parts is the understanding, organization and use of rules (e.g. about engineering planning or design). This theme will be analyzed when introducing the ontology perspective, used to verify the usefulness of knowledge tools and, finally, will provide examples in the practical session.

24. Multivariate Analysis in Environmental Chemistry, 2 CFU, SSD: CHIM/07).

Syllabus:
The course is aimed at providing students with advanced tools for environmental data analysis and innovative elaboration approaches. At the end of the course, students will be able to extrapolate the most relevant information from large datasets, very usual in Environmental Sciences. The lessons will introduce the principal concepts of the Multivariate Analysis and, through a benchmarking with

univariate approaches, the benefits of the new techniques will be highlighted. The objective is to develop the ability to choose the optimal model for analyzing data.
The main topics to be discussed are the following:
- Multivariate approach for a multivariate world
- Introduction of Multivariate Analysis. Advantages of Multivariate Analyses.
- Principal Component Analyses (PCA) and Correlation Analyses (CA)
- How to collect the environmental data
- How to pre-treat the environmental data (pretreatment and scaling)
- Methods for "outlier" identification. Means of the "outliers" in Environmental Analyses
- Classification Methods and Prediction Models.

Finally, through discussion of some real applications, the course intends to provide students with few basic rules for a success multivariate analyses in Environmental Chemistry.

25. Statistical methods for environmental analyses in a changing climate, 2 CFU, SSD: ICAR/02.

Syllabus:
Statistical analysis of environmental variables plays a key role in the process of understanding variability and changes in climate-driven phenomena. The usefulness of this approach is widely recognized in literature, and several tools can be implemented for conduct this kind of analysis.
Aim of the course is to illustrate the main concerns about the statistical theory exploited in this field, providing student basic notions for their implementation in R and Matlab programming languages.
The following topics will be covered by proposed course:
1. Introduction to environmental analyses in a changing climate: this introductive part aims to provide a description of key climate variables and their role in interpreting physical phenomena.
2. Notions of probability, statistic and time series analysis: fundamental definitions and axioms of probability and statistic theory; random variables and stochastic processes; statistical characterization of a time series and notes on missing data; references to extreme value theory;
3. Non-stationary processes and statistical test for change-points and trends detection: implications of the presence of deterministic trends in stochastic processes; theory of statistical tests and related errors; power of tests.
4. Elements of R and Matlab and applicative examples: in the last part of the course the utility of Matlab and R programming languages for statistical analysis of real time series will be highlighted. Fundaments of these programs will be illustrated, with the scope to provide main elements for realize a detailed statistical analysis of a time series.

26. Themes and methods of contemporary architectural research, 3 CFU, SSD: ICAR/14.

Syllabus:
The main educational objective of "Themes and methods of contemporary architectural research" course is to provide the PhD student the theoretical basis for the formation of a critical knowledge of the main themes that feed the contemporary architectural research. The course will be articulated into lessons and exercises complementary to each other. Through the lessons the knowledge will be transmitted and the comprehension skills will be developed; through the exercises the acquisition of the ability to apply knowledge and understanding will be verified. The course will be divided into two parts, corresponding to two blocks of lessons and exercises, complementary to each other. The first part of the course will address to general issues concerning the ontology of architecture and its special cognitive status of discipline that lies between the epistemological model of the scientific disciplines and that of the artistic disciplines.
In the second part of the course will be proposed a thematic deepening on three central themes for the contemporary architectural debate, concerning the relationship between "Architecture and City",

the relationship between "Architecture and Ancient", the relationship between "Architecture and Construction".

27. The historical research and the study of the Ancient architecture, 3 CFU, SSD: ICAR/18--L-ANT/07.

Syllabus:
Ancient architecture is almost always in a state of ruin. His study, aimed at formulation of reliable hypotheses of reconstruction of the building, must be based on integrated survey methodologies that use the detailed analysis of the ancient ruined building as an essential knowledge base. They are taken into consideration therefore, besides to the observations derived from the results of the architectural survey, also any iconographic testimonies from other sources, such as vascular painting, frescoes, bas-reliefs, images on coins, etc. The building and its construction and morphological details, as well as, when present, his architectural sculpture must then be compared with others contemporary architectures, in order to include it in its historical-geographical context.
The course therefore aims to present some completed or ongoing architectural research that can effectively illustrating the research method mentioned above. In particular, the following case studies will be addressed:
The Arch of Trajan in Leptis Magna
The reconstruction of urban planning of Kos
The Curia in Leptis Magna
Architectural sculpture in the anastylosis of ancient buildings
Urban planning in Ionia and Caria between the archaism and the Hellenistic age
Architectural and decorative models in the mausoleums of the imperial age in Libya
The Hellenistic theater in Mytilene
The townscape in the figurative culture of Greek and Roman times
The urban planning ant the agora of Byllis (Albania)
The Cistern in the agora of Byllis, analysis of the typology and of the constructive aspects.

28. Historical research and study of the city and contemporary architecture, 3 CFU, SSD: ICAR/18

Syllabus:
The course is divided into an institutional part of the program and in an experimental part, implemented in the modalities of the Laboratory, within which will be provided some exercises aimed at strengthening the student's critical skills starting from a basic training about the methods and materials for historical research in the second half of the twentieth century.
The course aims to provide students with a correct study methodology aimed at acquiring a historical-critical knowledge of the history of contemporary architecture, from the origins of modern architecture to current architectural trends, with particular attention to the widespread ideas of Italian tendency. and, in particular, to the figure of Aldo Rossi and the masters who revolve around the editors of the Casabella of Rogers, also and above all in relation to the worldwide resonance that they had within the architectural debate after World War II.

29. Analysis and representation techniques for architectural research, 3 CFU, SSD: ICAR/17.

Syllabus:
The course aims to stimulate a critical attitude in the study of the city and architecture, providing to the young researcher a repertoire of analysis techniques and representation models to support research.
The techniques of survey of the existing, laser scanner and photo-modeling, are joined to those of the inexistent, graphic analysis and graphic reconstruction, providing the tools and methods for a research of architectures in praesentia that can be studied and analyzed also metrically, that those in absentia designed and never realized.

The course aims to analyze and graphically return the different components of architecture and the city, and with the tools of drawing and modeling investigate the historical / evolutionary process or the ideation / composition process too. These are fundamental cognitive moments for the study of an architecture or a part of the city and at the same time to analyze the complex personality of its author.
Practical exercises alternate with lectures encouraging young researchers to use the techniques of analysis and graphic representation, articulating and stimulating their critical skills in reading an architecture and / or the city or a portion of it.

30. L'architettura delle forme strutturali, 3 CFU 3, SSD: ICAR/12.
Syllabus:
Il corso si articola in una prima parte in cui sono individuate le Forme della Costruzione, ovvero i principi formali che costituiscono il fondamento delle forme strutturali; quindi la conoscenza degli elementi che le costituiscono ed infine le rispettive regole di composizione. I principi formali si riconoscono essenzialmente nel sistema murario, nel sistema trilitico e nel sistema a traliccio, declinati in differenti possibili variazioni che dipendono dall'uso di materiali e tecniche. Allo stesso tempo si riconoscono altri principi riferiti ai sistemi di copertura: la copertura piana, il tetto, la volta, la cupola.
Il corso si avvia con un breve excursus storico, nel quale si mostrano le origini di tali principi, il loro consolidarsi e svilupparsi attraverso il progressivo potenziamento della tecnica. Particolare attenzione si rivolge alle esperienze del Novecento più significative, quando tali principi assumono una rilevanza decisiva nell'assolvere alle necessità della cosiddetta "architettura delle tecniche", cioè al progetto di grattacieli, fabbriche, edifici commerciali, edifici religiosi, ecc.
Non si trascura la costante riflessione che questo tema ha sviluppato, soprattutto nel Novecento, accompagnando la pratica del progetto. Questo aspetto costituirà la parte teorica dell'intero corso.

31. Design and management of research projects, 2 CFU, SSD: ING-IND/17.
Syllabus:
An overlook of main funding opportunities and programmes. The EU financial framework. Basic principles of funding of research projects. The project cycle management methodologies: the logical framework and the WBS, GOPP methodology, stakeholders engagement and management. Tools and techniques for writing good proposals. Techniques and tools for an effective project management. Accounting and financial management of an EU research project. Risk management techniques. The project evaluation, dissemination and replication: good practices and lessons learned.

Offerta didattica 2021-2020.

L'elenco dei corsi attualmente proposti ed approvati per l'offerta didattica dell'A. A. 2021-2022, che verrà riesaminata, completata e bandita nel 2021 a seguito di nuova delibera del Consiglio, è il seguente:

1. Fundamentals of Information Theory, 2 CFU, SSD: ING-INF/03

Syllabus:
Definition and measures of Information
Entropy concept
Mutual and conditional information
Shannon Theorem
Channel capacity with gaussian noise
Example of source conding

Application of Information theory to security concepts

2. Video Compression, 2 CFU, SSD: ING-INF/03

Syllabus:
Video signal coding. MPEG and H.264/H.265 compression techniques.
CODEC model. Macroblocks and slices. Temporal model. Spatial model. Entropy encoder.
Temporal model. Motion estimation anche compensation. Motion vectors.
Spatial model. Discrete Cosine Transform (DCT). Quantization. Rescaling and Inverse Quantization.
Overview of H.261, H.263, H.264 standards.
Overview on video applications in Internet.

3. Emerging technologies and methodologies for the Cyber Security, 2 CFU, SSD: ING-INF/03

Syllabus:
- Baseline approaches to security in current communication technologies
  - Overview of widely used communication technologies and related security services/frameworks
- Emerging encryption, authorization, and authentication mechanisms
  - OAuth 2.0 framework
  - Access control mechanisms based on IBAC, RBAC, and ABAC
  - Attribute Based Encryption (ABE) and its extensions
  - Suitable mechanisms for distributed and multi-authority environments (i.e., the symbIoTe security framework, DMA-CP-ABE)
- Security approaches for IoT, Edge, and cloud-based Cyber-Physical Systems (CPS)
  - Lightweight cryptography and key management scheme for the Internet of Things
  - Elliptic Curve Qu-Vanstone (ECQV) algorithm and Implicit X.509 certificates
  - Edge-driven security methodologies
  - Security in the cloud: goals, challenges, emerging solutions, the H2020 GUARD use case
- Blockchain and Smart Contracts
  - Reference applications
  - Emerging platforms

4. Devices and systems for satellites, 2 CFU, SSD: ING-INF/01

Syllabus:
Introduction to the Space environment
Electronic Systems for Satellite Platforms
Electronic Systems for Telecom and EO Payloads
Degradation phenomena in electronic systems due to the space environment

5. Supervision and monitoring of renewable energy systems, 2 CFU, SSD: ING-IND/31

Syllabus:
Supervision and monitoring systems for RES
Statistical tools for performance analysis of RES
Infrared analysis for the detection of faults/anomalies of RES
Software for the diagnosis of faults/anomalies - DISS

6. Green photonics for a sustainable economy, 2 CFU, SSD: ING-INF/02

Syllabus:
Introduction to green photonics.
Introduction to numerical simulation of photonic devices

Sustainable energy generation: nanostructures for photovoltaics.
Photonic devices for reduced energy consumption.
Photonic sensors for environmental monitoring.

7. Non-integer order systems and controllers, 2 CFU, SSD: ING-INF/04

Syllabus:
Introduction to fractional calculus and non-integer-order (fractional-order) systems
Modeling and identification of non-integer-order systems
Models for automotive and mechatronic applications
Non-integer-order (fractional-order) controllers: types, design, tuning, realization, fundamental properties, simulation, experimental validation
Non-integer-order (fractional-order) controllers for industrial, automotive, mechatronic and robotic applications

8. Innovative Models, Optimization Strategies and Services for Smart Building and Smart Mobility systems, 2 CFU, SSD: ING-INF/04

Syllabus:
The course includes the following main sections:
1) Introduction to Smart Buildings: definition, requirements and main challenges.
2) Innovative optimization and control techniques for Smart Buildings based on centralized and distributed approaches.
3) Modeling and simulation by MATLAB and SIMULINK of electric loads/systems in Smart Homes and Buildings.
4) Introduction to Smart Mobility: definition, requirements and main actors and challenges.
5) Innovative models and approaches based on optimization and virtual sensors for innovative mobility systems and services.

9. New Technologies For Diagnosis In Medicine, 2 CFU, SSD: ING-INF/05-MED/11

Syllabus:
- Introduzione
- Sistemi cyberfisici per la raccolta e l'analisi automatica di biosegnali. Approcci basati sull'elaborazione numerica dei segnali e sul machine learning.
- Principi di ecografia. Fisica degli ultrasuoni, armoniche tissutali, effetto Doppler. Hardware e Software di acquisizione. Software di ricostruzione in ambito cardiovascolare. Tecniche 3D. Esempi applicativi.
- Principi di risonanza magnetica. Hardware. Principi di formazione delle immagini. Sequenze impiegate in ambito cardiovascolare. Nuove tecniche ed esempi applicativi.
- Principi di acquisizione di immagine in TC.
- TC cardiovascolare: piattaforme e ricostruzione d'immagine.
- TC cardiaca: display contemporaneo di data imaging clinico, analisi e quantificazione.

10. MATLAB Recipes For Measurements Data Processing, 2 CFU, SSD: ING-INF/07

Syllabus:
Introduction: TOMFL (Test of MATLAB as a Foreign Language)
How to synthesize test signals with given spectral characteristics in MATLAB.
How to generate synthesized signals with an arbitrary waveform generator.
How to acquire signals with Data Acquisition hardware.
How to process acquired signals in the time and frequency domain to obtain selected measurements (frequency response functions, distortion, noise, etc.).

11. Advanced Probabilistic Methods For The Reliability (Performance-Based) Analysis In Engineering Problems, 2 CFU, SSD: ICAR/09

Syllabus:

Introduction of elements of probability theory applied to structural and earthquake engineering: In the first part, basic elements and references about the common procedures adopted in the structural engineering are provided, accounting, in particular, the case of seismic actions. According to the recent scientific literature, the course will provide an overview about seismic demand quantification, conceptual design, mechanical and geometrical parameters configuration of the buildings, numerical modelling through finite element approaches, linear and nonlinear analyses. Within this framework, the discussion will focus on the basic concepts of probability theory applied to structural engineering, starting from the definition of random variables, statistics and sampling, regression analyses, appropriateness of fit tests, estimation of distribution parameters, testing of hypotheses and related significance (4 hours). The probabilistic approach of Performance Based Earthquake Engineering (PBEE): In this part, the main limits of deterministic approaches, as commonly used by practitioners, will be highlighted, and the approach of PBEE will be formally presented. Within this framework, all aspects covered by the PBEE will be faced, accounting for the probabilistic study of seismic demand (through the definition of the probabilistic seismic hazard analysis), structural analysis (through the definition of modelling and analysis methods, such as Incremental Dynamic Analysis - IDA, Multi Stripes Analysis and cloud analysis), damage analysis (through the definition of the fragility curves by using articulated and simplified tools) and loss analysis (through the definition of the losses curves by using articulated and simplified tools) (8 hours). Practical examples of PBEE and applications in different fields of civil engineering: Based on the previous concepts, some applications of PBEE to the analysis of Reinforced Concrete (RC) buildings will be shown, with a specific reference to the most useful numerical tools presently available (from the simplest to the most sophisticated). Finally, the concepts and applications learned in the first two parts will be the starting point for developing application problems in different fields of civil engineering (e.g. Transportation Engineering, Water Resources, Environmental Engineering, Geotechnical Engineering, …), according to the interests of the PhD students (8 hours).

12. Lab-and-field data acquisition and processes in Hydraulics, 3 CFU, SSD: ICAR/01.

Syllabus:

Goal. The course provides the basic concepts necessary to carry out measurements, process data and derive hydrodynamic and physical meanings form large data sets.

Program. The following topics are studied, combining theory and practical examples.

Measurement definition and concept. Measurement instrumentation and sensors. Sources of error. Measurement uncertainty.

Measurement in static and dynamic conditions.

Instrument calibration. How to get a calibration curve from laboratory data.

Sensitivity, accuracy and precision. Measurement range and frequency response. Instrument precision. Measurement error. Theory of errors.

How to carry out a measurement. Nyquist theorem. Sampling duration.

Signal analysis in time and frequency domain. FFT and IFFT. How to obtain a spectrum of the measured signal with FFT technique.

Acquisition signal chain. Control and management of remote measuring stations, with sensors sampling hydrodynamic parameters.

Acoustic and laser signal sources. Doppler effect. Measuring flow velocity with LDA and ADV sensors. Practical trials at the Coastal Engineering Laboratory - LIC of the DICATECh and analysis of acquired data.

13. Statistical data analysis starting from the highway engineering case, 2 CFU, SSD: ICAR/04.

Syllabus:
Motivation. Each field of research in engineering may potentially need exploratory and statistical analyses on large dataset of different nature. Highways as a part of the transportation systems generate large volume of data (such as infrastructure, traffic and accident data) which are important for several applications, primarily for safety reasons.
Goal. To provide a general theoretical background and operational methodologies (use of open-source software applications) for exploratory and statistical analyses on database, by using case studies and example problems from the highway engineering research. Program. The lectures will be organized by explaining general methodologies for data analyses starting from examples of dataset from the highway engineering. The methodologies covered are: Exploratory analyses of dataset, Tests of differences between groups (parametric vs non-parametric), Regression modelling (considering calibration). Even based on infrastructure, traffic and accident data, the transferability of the presented methodologies to other fields will be stressed, to ensure the usefulness of the course at a multidisciplinary level. Moreover, basic knowledge in using the open-source statistical software "R" may be of interest for all research fields. Verification. Based on a report explaining the development of a model or the application of statistical tests on sample of data (virtual or real) which are relevant to the individual research of each student, by means of the explained methodologies.

14. Advances in Geomatic Engineering, 3 CFU, SSD: ICAR/06.

Syllabus:
Recent advances in space (satellite) technology, computing (software and hardware) technology and Geomatic engineering instrumentation technology have had a revolutionary impact on the practice of many engineering fields.
The goal of this course is to provide the students the theoretical background and knowledge necessary to manage modern complex geospatial information and technology.
The lectures will deal with the following research areas:
Multimedia cartography and information delivery;
Geospatial Information Science and Geographic Databases;
Geospatial Web and Big Data;
Technologies and methods in Remote Sensing (proximal/drone/aerial/satellite platforms);
Survey and 2D/3D geospatial data processing;
Geospatial data modelling and analysis.
The advanced topics may serve as an introduction to research skills that may be useful at multidisciplinary level.

15. New Frontiers Of Scientific Research Based On 3d Printing In Structural And Building Engineering, 2 CFU, SSD: ICAR/09 – ICAR10.

Syllabus:
The application of 3D printing in Structural, Building Engineering and Mechanics of Materials (e.g. 3D printing of buildings or materials with micro-structure) are becoming increasingly important in the last few years. This course aims at introducing students to the new frontiers of scientific research based on 3D printing technologies.
Firstly, the teaching program will provide an overview of the actual framework of the use of the 3D printing technology in the field of structural and building engineering. State of the art techniques, pilot projects and innovative applications will be sowed in order to point out the potential of the technology.
Secondly, various 3D printing machines will be introduced with a particular focus on the best choice of technology and printable material for specific research objectives.

Thirdly, a specific research project (which includes the use of 3D printing) will be developed by the PhD students on a topic regarding their personal research. The project can concern the realization of prototypes or the development of new methodologies for the use of the technology.

16. Theories and methods of design for the Antique, 3 CFU, SSD: ICAR/14.
Syllabus:
The course is divided into two parts, corresponding to the two blocks of lessons and exercises.
The first part (20 hours, 2 ECTS) will be structured into four thematic sections: the first, by investigating the contributions offered by the Masters of Architecture between the XIX° and XX° centuries and deducing their theoretical background, will try to outline the general principles underlying the main points of view that connote contemporary architectural research; the other three will be thematically articulated and focused on the relationships between "Antique and Landscape", "Antique and City", "Renovation and Museography", and will see the compositional analysis of some exemplary contemporary works, in order to recognize methods and techniques of the design for the Antique.
The second part (10 hours, 1 ECTS) will be devoted to the exercises. They will be carried out in the modality of an intensive design workshop, dealing with and developing a project concerning the main topics of the course.

17. Theory of Contemporary Architectural Research, 3 CFU, SSD: ICAR/14.
Syllabus:
It seems lost today, in architecture as generally in arts, an unitary point of view on which to found a theory on. That civil conscience that has always been the basis of the art of building seems no longer part of the collective heritage. This condition is recognizable in the contradictory experience of contemporary architecture.
For this reason the class aims to try to outline a "classical" theory of architectural research; a classicism that does not renounce, rather it investigates, the culture of modernity, trying to measures itself against this alleged contradiction. All the architecture that we can include within the “classic” experience (that we can also define “rational experience”) is characterized by a peculiarity: the intelligibility of forms, along with we define a method of formativeness.
According to this idea of architecture, there’s no advancement of forms without an advancement of knowledge - without an increasingly higher level of self-awareness. Hence the need for a theory of architectural research.
The method of formativeness we want to investigate regards three major chapters of architecture:
The relationship among architecture, city and landscape;
The “construction issue”;
The question of the project with the Ancient.

18. Theories and Methods of the Project for the City, 3 CFU 3, SSD: ICAR/14.
Syllabus:
The course is divided into two parts, corresponding to the phases of lessons and exercises.
The first part of the course (20 hours, 2 credits) will deal with issues related to the city as a historical- aesthetic palimpsest, interpreted as a synthesis of an approach that is both documentary and transformative, based on the relationship between physical form and "cognitive form".
The second part (10 hours, 1 credit) will instead focus on issues relating to the processes and methods of urban interpretation and modification throughout history, focusing especially on those that have appeared since the twentieth century, with their multiple problems.
In this sense, various themes will be central, such as that of the "diachronic relationship" within the general urban processes, the theme of the narrative function of their inheritance, and finally the theme of the consequent theoretical and methodological choices, developed -in different ways- in the main researches of Italian and international contemporaneity (from the "organic vision"

proposed by the first Roman and then Muratorian schools, to the phenomenological-cognitivist one proposed by the various Italian and American schools already in the second half of the 1900s, to the analytical- structuralist research of the successive neo-rationalist tendencies, up to the most recent ones, which experience the "dialectical contradiction" as a tool through which to reformulate the figurative heritage in relation to the unprecedented condition of the contemporary city).
This phase will be carried out through an intensive urban design workshop, based on the critical exercise of the main themes developed during the course.

19. Theories and Methods of the Project for the Territory, 3 CFU, SSD: ICAR/21.

Syllabus:
The course is divided into 2 steps, corresponding to the 2 blocks of lessons and exercises.
The firs tstep (20 hours, 2 ECTS) will be structured in 4 thematic sections: the first will deal with general questions on the main approaches to the contemporary territories regarding a discipline that is found between the epistemological model of scientific disciplines and that of Social Sciences; the other 3 lessons will focus on the topics that are at the heart of the contemporary disciplinary debate (as well as in the PhD course in "Project for Heritage: Knowledge and Innovation"), relating to the relationship between" City and Landscape "and" Architecture and Heritage ".
The second step (10 hours, 1 ECTS) will be dedicated to exercises and seminars of teachers external to the course: the first will be conducted in the form of a workshop on sample territories on which to experiment an approach to contemporary issues (relationship between places and communities, territories palimpsest, territories in crisis…), developing a synthetic written-graphic report concerning the main topics of the course. A seminar held by an Italian or foreign external personality, with a relevant point of view on the topics of the course, will allow a wide reflection between PhD students and author on the topics covered.

20. Theories and methods in structural design: modeling and experimental issues, 3 CFU, SSD: ICAR/08 – ICAR/09

Syllabus:
The shape of masonry constructions and the influence of the curvature in the load bearing capacity of arches, domes and vaults. Seismic actions and masonry constructions.
Mechanical behavior of masonry: heterogeneity, different behavior in tension / compression, non-linear mechanical response, anisotropy, failure modes, damage.
Modeling strategies: micromechanical models, FEM and DEM implementation of micromechanical models, macro-mechanical models, multiscale models, NT (No-Tension) and RNT (Rigid No-Tension) models, macro-elements.
Limit Analysis: static and kinematic approaches. From the static approach of Limit Analysis to the relation between shape and structures in masonry arches and vaults (and back to graphic statics).

Infine, si prende atto che il Collegio dei docenti del DRIMEG ha deliberato di proporre al Consiglio del DMMM di bandire i seguenti sei insegnamenti di terzo livello:

1. Wave energy conversion for green power generation, 2 CFU, SSD: ING-IND/08;

2. Nonlinear Identification of Vibrating Mechanical Systems, 2 CFU, SSD: ING-IND/13;

3. Mechanical Characterization of Materials by Advanced Ultrasonic Tests, 2 CFU, SSD: ING-IND/14;

4. Dynamical behavior of nonlinear structures, 2 CFU, SSD: ING-IND/14;

5. Mixed Reality for data visualization in the Smart Factory, 2 CFU, SSD: ING-IND/15;

6. Multidisciplinary Research Applications of 3D Printing, 2 CFU, SSD: ING-IND/16.

Qualora alcuni di questi insegnamenti non dovessero essere banditi dal Consiglio del DMMM, essi potrebbero rientrare nell'offerta didattica della SCUDO per l'A. A. 2021-2022 insieme ad altri insegnamenti che saranno proposti dal Collegio del DRIMEG o dal Consiglio della SCUDO.

Richiesta di accordo con Università di Bari per l'ampliamento dell'offerta didattica di terzo livello

In seguito alla richiesta pervenuta al Coordinatore del corso di dottorato in Ingegneria elettrica e dell'informazione, prof. Grieco, da parte della Coordinatrice del corso di dottorato in matematica e informatica dell'Università di Bari, prof.ssa Costabile, il Consiglio esprime parere favorevole alla frequenza dei corsi erogati dalla Scuola di dottorato del Politecnico di Bari da parte dei dottorandi del corso di dottorato in Matematica e Informatica dell'Università di Bari in base ad un accordo di reciprocità che prevede la stessa possibilità per i dottorandi del Politecnico di Bari nei confronti dei corsi erogati dal Università di Bari.

P.3) Organizzazione della Cerimonia di consegna dei diplomi per il XXXII ciclo.

In seguito ad accordi intercorsi con il Rettore, il giorno venerdì 3 aprile alle ore 9:00 nell'aula Magna A. Alto del Politecnico di Bari avrà luogo la cerimonia di consegna dei diplomi di dottorato ai neo-dottori del XXXII ciclo. La giornata prevede l'intervento del Rettore, di un eventuale ospite esterno, del direttore della Scuola di dottorato; la presenza dei coordinatori dei corsi di dottorato.
Il Consiglio inoltre stabilisce di inserire due interventi di dottori di ricerca del Politecnico di Bari come testimonianza della loro esperienza lavorativa.

La seduta si scioglie alle 18:30. Del che è redatto il presente verbale, che viene letto e approvato seduta stante.

Il Direttore
prof. ing. Pietro De Palma

Il Segretario
prof. Ing. Alfredo Grieco

VERBALE DEL CONSIGLIO
DELLA SCUOLA DI DOTTORATO DEL POLITECNICO DI BARI

FOGLIO DELLE FIRME

Seduta n. 2/2020 *del giorno 3 marzo 2020*

	PROF			Firma	Assente giustif.	Assente
1	PROF.	**DE PALMA**	**Pietro**			
2	PROF.	**DEMELIO**	**Giuseppe Pompeo**		AG	
3	PROF.	**DOTOLI**	**Mariagrazia**			
4	PROF.	**GIGLIETTO**	**Nicola**		AG	
5	PROF.	**GRIECO**	**Alfredo**			
6	PROF.	**MASTRORILLI**	**Pietro**		AG	
7	PROF.	**MOCCIA**	**Carlo**		AG	
8	PROF.	**MOSSA**	**Michele**			
9	PROF.	**PASCAZIO**	**Giuseppe**			
10	PROF.	**PICCIONI**	**Mario Daniele**			
11	DOTT.	**MOTTA ZANIN**	**Giulia**			