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Dimitra V. Achillopoulou

Education

- Dr Dimitra Achillopoulou graduated from the Department of Civil Engineering of Democritus University of Thrace (DUTH) with a 5-year diploma in 2009. Through a curriculum of 69 courses, equivalent to a Masters of Engineering (MEng), she obtained a comprehensive background in Civil Engineering, with specialization in structural engineering. In 2010 she obtained a first-class MSc degree on the design of structures for earthquake resistance from the same Department. In 2011 she continued her studies in the Laboratory of Reinforced Concrete in DUTH to pursue her doctorate studies, partially supported financially by Sika Hellas LTD, on the repair and strengthening of reinforced concrete components focusing on the transfer mechanisms along interfaces between the intervention and the existing structure. She completed her doctoral studies after three years, in June 2014 with distinction.

Research & teaching experience

07/2017-today

- Assistant Professor** (tenure-track position). Recently appointed Assistant Professor of Design and Rehabilitation of Buildings at the Department of Civil Engineering, DUTH.

2018-2019

- Teaching of the following undergraduate modules: (1) Building Construction I, (2) Building Construction II, (3) Special Issues of Building Materials and (4) Rehabilitation and Maintenance of Buildings and Monuments. Also, she is the supervisor of two theses.

06/2014-06/2017

- Postdoctoral researcher** *Department of Structural and Geotechnical Engineering, Laboratory of Structures and Materials, La Sapienza University of Rome (LSUR)*. The main field of research was the use of **guided wave propagation** on prestressed components and metals e.g. Fiber Reinforced Polymers (FRP) laminates, aluminium, using ultrasonic waves. This included the examination of nanomaterials, commonly used in bridge deck retrofitting schemes, with non-destructive health monitoring tests to detect cracking or damages. She conducted finite element analyses and simulations, on a variety of software platforms, such as Ansys, Matlab, Mathematica, to determine the **characteristics of the discontinuities** by observing selected response parameters e.g. reflections and transmissions of waves. Also, part of her research on **structural health monitoring (SHM)** was experimental, using guided waves, which is commonly used for infrastructure assets of high importance, such as bridges and monuments. After earning her PhD and in parallel to the appointment at LSUR, she conducted *volunteering research* at the Department of Civil Engineering, DUTH for another three years. The main objective of this research was the experimental and analytical investigation of reinforcement details of

2014-2017

strengthened reinforced concrete elements with FRP laminates and Near Surface Mounted (NSM) techniques under combined loads, health monitoring diagnosis through ultrasonic applications, analysis of code provisions to check their dispersion, focusing on **interface response and fractures between the substrate and the FRP**.

Whilst being a postdoctoral researcher in LSUR the *Fellow* was also **teaching assistant at the Faculty of Architecture, at LSUR**. She served as an invigilator for the undergraduate courses on Statistics and Structural Mechanics in the Department of Architecture and was also required to mark written and oral exams.

2011-05/2014

● **Doctoral studies and appointed Teaching Assistant (TA)**, Department of Civil Engineering at DUTH. During her doctoral studies she:

- Conducted over 100 experiments on reinforced concrete columns to investigate the **shear transfer mechanisms** between the existing and the strengthening material. She gained valuable experience on the **slip-stress laws** that define the **interface performance**, which will be further assessed in this research project on bridge decks.
- Developed complex and **advanced finite element models (FEM)** on **Ansys** and **Abaqus** using plasticity models for concrete simulation. This knowledge is useful for simulating the interface of concrete bridge decks strengthened with FRPs systems to investigate **local phenomena and discontinuities** that may be caused during bridge overloading.
- Investigated construction imperfections and proposed **quantification damage indices** and modelling to examine their influence on the **capacity** of the structure. This experience will assist in addressing the initial construction imperfection (air-pockets) due to poor casting conditions. This phenomenon is expected to exist in bridge decks retrofitting schemes, in which cement injections are applied after semi-destructive monitoring tests.
- Assessed the components of **shear transfer mechanisms** of strengthened concrete members and proposed new **interface coefficients** representing the efficiency, i.e. bonding and integration of the interface with the existing components. These indices assisted in the quantification of the **interface efficiency** in transferring loads and thus the resulting composite element, i.e. strengthening measures and existing component acts as one monolithic component. This can be a useful tool for the assessment of the efficiency of the strengthening measures.

As a doctoral researcher in the Civil Engineering Department of DUTH she also had **teaching responsibilities** and taught the following undergraduate modules: (1) Reinforced Concrete (RC) structures I (2010-2014), (2) RC structures II (2011-2013), (3) RC structures III (2013), the MEng module: (4) Design of RC structures with the use of software (2013-2014) and the MSc module: (5) Seismic performance of RC structures and use of advanced design software (2011-2013).

The **main duties** for the teaching assistance assignment were to: (a) supervise students' projects throughout the semester, (b) design and mark the assignments, (c) prepare material for the module i.e. the lectures and laboratories, including supplementary designs, using PowerPoint and AutoCAD, (d) managing and supervising the online module platform (e-class), (e) conduct laboratory tests and demonstrations of experiments on RC structural components, (f) introduce software packages for structure and finite element analysis (FEA) & design (e.g. Abaqus, Ansys Workbench, pi-systems, Seismostruct, Fespa, Risa-3D, Drain 3DX, SAP 2000 and others) to the students, (g) keep record of marks, evaluation of oral examinations and marking of exam scripts, (h) work in conjunction with with colleagues within the faculty on course material and evaluation policies, improving communication skills, (i) provide day to day supervision and support of students' under- and postgraduate theses (15 in total including two MSc theses).

2012-2013

● **Adjunct Lecturer**, during her doctoral studies, she worked in parallel as an adjunct lecturer at the Department of Architecture, at DUTH. She taught the following undergraduate modules: (1) Statics I (2012), (2) Seismic design of RC structures (2012), (3) Materials and Statics II (2013), (4) Steel-, Timber and Composite Structures (2013). The main duties of the her *teaching appointment* were similar to the ones mentioned above.

2011-2018

● **External associate of the Quality Assurance Unit of DUTH**, responsible for the implementation of the quality policies and indices within DUTH. During this post, she worked on organizational matters, including the preparation of the evaluation reports for various Departments of DUTH. This post was in support of the following main pylons: performance in teaching and research, condition

and adequacy of infrastructure, the efficiency of administration and students' welfare. She has also been conducting studies regarding bibliometric indices achieved by other Departments of the same scientific field within Greece, extracting quality indices and conducting research and preparing scientific reports regarding plagiarism issues, alumni monitoring matters and report concerning other University activities such as research projects, outreach activities and engagement with the local society, awarded DUTH activities, etc. She participated at the fund raising activities of DUTH for new infrastructure buildings in Komotini, from the European Investment Bank by preparing technical annexes and presentations regarding the sustainability of the project.

2010-2018

- **Freelancer, Civil Engineer.** Since 2010 she worked as a freelancer engineer on structural designs, consulting and management services for design and construction as well as in the diagnosis, assessment and analysis of structures in general. The experience gained during these projects also demonstrates the valuable skills that she honed whilst dealing with real-world designs, compliant to design guidelines and current legislation conforming to practical restrictions. These designs are based on the applicability, practicality and constructability of the structure, skills that are not gained in the academic environment. Moreover, her experience in management of industrial buildings and infrastructural projects has fueled her with valuable experience in management and problem-solving. She has worked in the region of Southern-Eastern Europe and the Balkans among others as:
 - *Technical Consultant: project management, fund raising, design checker and consultant on construction matters and problem-solving of industrial hall and infrastructural sub-projects according to standards regarding energy consumption, energy efficiency and security measures, quality control and project management.*
 - *Designer engineer of commercial and non-commercial buildings. Among others:*
 - *Design including modelling, analysis and detailing for new residence RC building, on behalf of a prefabrication construction company*
 - *Assessment, analysis and detailing of RC, steel, masonry and timber structures*
 - *Consultancy on the damage of RC structural members (including carbonation, corrosion, chloride exposure, seismic damages) for residential structures designed based on old codes*
 - *Strengthening of a non-commercial three-story RC buildings using steel frames or RC jacketing*



Contribution in research projects

Dr. Achillopoulou has 10 years of research experience including four years of independent research activity in the field of structural engineering. The focus of her research is on the repair and strengthening of structures and their diagnosis through non-destructive tests and methods. She has authored and co-authored a total of 26 papers. The scientific journal papers were published in highly reputed peer-reviewed journals with impact factors in the field of structural engineering, whilst the articles published in conference proceedings and the book chapters were also peer-reviewed. Three out of nine journal papers were co-authored without her PhD supervisor and one is single-authored, which demonstrates her research independence. She has participated in research projects as Principal Investigator as well as researcher. The most important ones are:

- **2016** Dynamic characterization of materials and 3D visualization of discontinuities in solid media, Project for Young Researchers, La Sapienza University of Rome Principal investigator
- **2014-2017** Dynamic characterization of materials and structures (ICAR 08), Department of Structural and Geotechnical Engineering, La Sapienza University of Rome Research Assistant
- **2011-2012** Investigation of the seismic vulnerability of RC structures, Civil Engineering Department, School of Engineering, Democritus University of Thrace Research Assistant



Main research outputs and publications

Dr. Achillopoulou has contributed to the current state-of-the-art in: (1) strengthening of RC and prestressed structures, (2) the improvement of the shear transfer mechanisms in structural interfaces and (3) detection and characterization of discontinuities in solid media. Her research has been published in peer-reviewed scientific journals and conferences. Below, the main research outputs are discussed in the framework of three **niche research areas** in which the *she* has gained valuable experience: brackets with numbers cite publication as in relevant part):

- Shear transfer mechanisms along interfaces of concrete elements: In rehabilitation techniques, the force transfer mechanisms between the existing and the added material (e.g. the strengthening measure) are of paramount importance. This is important because the strengthening measure sustains loads only when it becomes an integral part of the structure enabling the load transfer into it. She has conducted seven-years of research on the interface behaviour through path diagrams, which show the percentages of transferred load to the new structural component and the contribution of confinement in the load transfer [J9, J7]. Also, she continued her research with the decomposition of the transferred load by each shear component (cohesion, friction, dowel action), which enabled her to understand the contribution of each **shear transfer mechanism** to the effectiveness of the retrofitting schemes and its life cycle [J1]. Moreover, she has investigated the **interface treatment** e.g. pitching and chipping, which is a very common technique in retrofitting, and its reinforcement to the effectiveness of the retrofitting [C9]. This also included simulations of the **interface response** using FEM analysis to illustrate local phenomena, and to investigate in-depth the effect of different types of interface reinforcement bars (clumps, dowels) and types of failure, including, but not limited to, non-linear strains and deflections of the strengthened element [J2, C9]. This research approach is important for comprehending and identifying areas of the structures which are not easily accessible, possible or permitted due to constructability issues or due to existing elements, such as joints, bridge deck beam connections, precast bridge deck connections etc. The aforementioned researches were combined with the application of relevant **code provisions**, i.e. guidelines referring to the shear transfer mechanisms, and this resulted in the illustration of the dispersions (Retrofit Code - Greece, EN 1998 part 3, *fib*-Bulletin 2010, ACI) [J6].

- Reinforced concrete elements strengthened with composites (FRPs): The use of composites in bridges is a research area of structural engineering that has attracted great interest due to the importance of existing buildings, infrastructures or monuments and she can contribute meaningful and practical research and applications within this area. She has conducted a thorough examination of the **confinement effect** [C14] and the overall **capacity** of RC columns through external confinement using FRP straps including the study of the dispersion of codes' predictions using the performance level as design criterion (EN 1998 part 3, *fib*-Bulletin 2010, ACI, CNR) [C4]. Moreover, she conducted research on the interface efficiency of FRPs installed on concrete substrates (carbon fiber reinforced polymers-CFRPs, glass fiber reinforced polymers-GFRPs, textile reinforced mortars-TRM's, **near surface mounted bars**-NSMs). With this research, she defined the **failure modes**, based on the performance level of each technique mentioned before. She defined the **efficiency of the FRP** system in terms of ductility and bearing and/or bending capacity, for each strengthening scheme, which improved the current understanding and knowledge of interface response. In particular, the effectiveness of externally bonded FRPs was investigated numerically taking into consideration the relative **slip of the materials** in contact and appropriate **shear stress-slip relationships** [J3].

- Detection and characterization of discontinuities using guided waves: She has been working on the detection and characterization of discontinuities using **Structural Health Monitoring** (SHM) techniques and in particular **guided waves** [C7]. This was achieved using **signal decomposition** methods and by interpreting the wave mode conversion in interaction with the kind of the discontinuity (symmetries, asymmetries) [J1, C3]. An improved numerical model, developed on the basis of the reciprocity principle, was used as a tool for detecting, mapping and characterization through response indexes (reflections and transmissions) of notches [J4]. Also, FEM simulations, developed by her, assisted in depicting the wave propagation mode conversion and the non-propagating wave modes to the boundaries of the discontinuity [C3, C6].

As a result of the abovementioned areas of interest, the following nine papers have been published and/or submitted to highly reputed journals with impact factors. Also, she has published another 14 peer-reviewed international conference articles and one book chapter:



Peer-reviewed scientific journals: (the 2016 impact factor IF is noted at the end of each publication)

- J1. Annamaria Pau and Dimitra V. **Achillopoulou**, 'Interaction of Shear and Rayleigh–Lamb Waves with Notches and Voids in Plate Waveguides', *Materials* 2017, 10, 841; doi:10.3390/ma10070841, **IF=2.654**
- J2. Dimitra V. **Achillopoulou**, 'Investigation Of The Stress Allocation Of Concrete Interfaces', *Structural Engineering and Mechanics, An Int'l Journal*, Vol. 63 No. 3, August 10, 2017, **Impact factor: IF 1.118**
- J3. Dimitra V. **Achillopoulou**, Alexandra N. Kiziridou, Georgios A. Papachatzakis and Athanasios I. Karabinis, 'Investigation of interface response of reinforced concrete columns retrofitted with composites', *Steel and Composite Structures Int.J* (2016), Vol. 22, No 6, December 30, **IF=1.796**
- J4. Annamaria Pau, Dimitra V. **Achillopoulou** and Fabrizio Vestroni, 'Scattering of guided shear waves in plates with discontinuities', *NDT & E International* 84 (2016) 67–75, <http://dx.doi.org/10.1016/j.ndteint.2016.08.004>, **IF=2.726**
- J5. Dimitra V. **Achillopoulou**, Arvanitidou C. Konstantinia, Karabinis I. Athanasios, "Performance of Reinforced Concrete Columns Repaired with Thixotropic mortar", *Computers and Concrete*, Vol. 15, No. 1 (2015) 635-656, DOI: <http://dx.doi.org/10.12989/cac.2015.15.1.635>, **IF=0.813**
- J6. Dimitra V. **Achillopoulou**, Karabinis A.I., 'Assessment of Concrete Columns Repaired With Fiber Reinforced Thixotropic Mortar through Damage Indexes and Numerical Model', *Construction and Building Materials Journal* (2015), DOI: <http://dx.doi.org/10.1016/j.conbuildmat.2015.02.044>, **IF=3.198**
- J7. Dimitra V. **Achillopoulou**, Theodoros Pardalakis and Athanasios Karabinis, 'Interface Capacity of Repaired Concrete Columns Strengthened with RC Jackets', *Transactions of the VŠB – Technical University of Ostrava*, No. 2, 2014, Vol. 14, Civil Engineering Series paper #14
- J8. Dimitra V. **Achillopoulou**, Athanasios Karabinis, 'Proposed model for predicting the reduced yield axial load of reinforced concrete columns due to casting deficiency effect', *Transactions of the VŠB – Technical University of Ostrava*, No. 2, 2014, Vol. 14, Civil Engineering Series paper #15.
- J9. Dimitra V. **Achillopoulou**, Karabinis I. Athanasios, 'Investigation of Shear Transfer mechanisms in Repaired Damaged Concrete Columns Strengthened with RC Jackets', *Structural Engineering and Mechanics*, Vol. 47, No. 4 (2013) 575-598, **IF=1.118**



Book Chapters (peer-reviewed):

- B1. Ashutosh Tiwari, Hiram K. Patra, and Xuemi Wang (eds.) *Advanced Materials Book Series: Advanced Surface and Interface Materials*, Publisher: WILEY-Scrivener Publishing LLC, USA, (205–248), 'Understanding The Basic Mechanisms Acting On Interfaces: Concrete Elements, Materials And Techniques', Dimitra V. **Achillopoulou** DOI: 10.1002/9781119242604.ch6



Peer-reviewed conference proceedings: (19 in total) a selection of published articles is given below (the full list of conference articles can be found on [Researchgate](https://www.researchgate.net)):

- C1. Dimitra V. **Achillopoulou**, Nikoleta K. Stamataki, Athina E. Savva and Athanasios I. Karabinis, 'Assessment Of The Response Of Seismic Isolated Public Building Made Of Structural Glass In Regions With High Seismicity', *CompDyn 2019, 7th ECCOMAS Thematic Conference on Computational Methods in Structural Dynamics and Earthquake Engineering* (accepted).
- C2. Dimitra V. **Achillopoulou**, Stergios Mitoulis and Ying Wang, 'Assessing and Monitoring Of RC Bridge Decks Retrofitted With FRPs Using Guided Waves Techniques: a review', *IABSE Guimaraes 2019*.
- C3. Dimitra V. **Achillopoulou**, Annamaria Pau, 'Characterization of Cavity Shapes in Waveguides using Shear and Lamb Waves', *EURODYN 2017, X International Conference on Structural Dynamics*.
- C4. Dimitra V. **Achillopoulou**, A. N. Kiziridou, G. A. Papachatzakis and A.I. Karabinis, 'Assessment Of Strengthening Techniques Of Reinforced Concrete Elements Rehabilitated With Composites', *Concrete Solutions 2016 Aristotle University Of Thessaloniki 6/2016*.
- C5. Annamaria Pau, Dimitra V. **Achillopoulou**, 'Scattering Of Shear And Rayleigh-Lamb Waves In Plate Waveguides With Double-Sharp Discontinuities', *Conference: GIMC 2016 XXI Congresso Nazionale di Meccanica Computazionale, At Lucca, Italia, June 2016*
- C6. Annamaria Pau, Dimitra V. **Achillopoulou**, 'Reflection And Transmission Of Shear Waves From Discontinuities In A Plate', *Aimeta 2015, XXII Congresso - Associazione It. di Meccanica Teorica e Applicata*.
- C7. Dimitra V. **Achillopoulou**, Annamaria Pau, and Fabrizio Vestroni, 'Damage Characterization In Waveguides With Ultrasonic Shear Waves' *Compdyn 2015, 5th ECCOMAS Conference on Computational Methods in Structural Dynamics and Earthquake Engineering*.
- C8. Dimitra V. **Achillopoulou**, Karabinis Athanasios, 'Initial construction damage effect on the behaviour of reinforced concrete columns', *2nd European Conference on Earthquake Engineering and Seismology: Istanbul 2014*.
- C9. Dimitra V. **Achillopoulou**, Theodoros Pardalakis and Athanasios Karabinis, 'Interface behaviour of

retrofitted columns subjected to axial repeated loading, 2nd European Conference on Earthquake Engineering and Seismology: Istanbul 2014.

- C10. Dimitra V. **Achillopoulou**, Eythimios Skeparnis and Athanasios Karabinis, 'Investigation of the interface behaviour of retrofitted concrete columns through finite elements.' 2nd European Conference on Earthquake Engineering and Seismology: Istanbul 2014.
- C11. Dimitra V. **Achillopoulou**, Pardalakis A. Theodoros, Karabinis I. Athanasios, 'Investigation of force transfer mechanisms in retrofitted RC columns with RC jackets containing welds subjected to axial compression' 4th Intern. Conference on Computational Methods in Structural Dynamics and Earthquake Engineering: Kos 2013.
- C12. Dimitra V. **Achillopoulou**, Tasiopoulos K. Thomas- Panagiotis, Karabinis I. Athanasios, 'Study of the behavior of RC columns strengthened with RC jackets containing dowels and different confinement ratios', 4th Intern. Conference on Computational Methods in Structural Dynamics and Earthquake Engineering: Kos 2013.
- C13. Dimitra V. **Achillopoulou**, Theodoros C. Rousakis, Athanasios I. Karabinis, "Force transfer between existing concrete columns with reinforced concrete jackets subjected to axial loading", 15th World Conference on Earthquake Engineering, WCEE 2012: Lisbon.
- C14. Dimitra V. **Achillopoulou**, Theodoros Rousakis, Athanasios Karabinis, "Square Reinforced Concrete Columns with Slender Bars Strengthened through FRP Sheet Straps", Conference on FRP Composites in Civil Engineering, CICE 2012 - Conference on Composites in Civil Engineering: June 2012, Rome.



❖ Invited lectures and presentations

Dr. Achillopoulou has been invited to deliver lectures on the importance of the **interfaces** and **force transfer mechanisms** in strengthened or repaired RC elements, and on **structural health monitoring techniques** of **guided waves** used for damage detection in solid media:

- Two invited lectures in the framework of the seminar:
 - 'Health monitoring, repair and strengthening-Reinforced concrete structures and materials', Laboratory of Reinforced Concrete, Department Civil Engineering, DUTh, 31/01-02/02/2017, Xanthi, Greece:
 1. Lecture 1: Interface mechanisms of strengthened RC elements
 - Lecture 2: The relationship between incident wave and defect symmetry: numerical results and comparison with analytical models
- Two invited Lectures titled: 'Strengthening design in structural members, reinforced concrete jacketing design' Meeting: 'Seismic Evaluation and Upgrading of Buildings' Capacity", Technical Chamber of Greece. The first lecture was delivered in February 2013 in Larisa and the second one in December 2012 in Xanthi.



Scholarships-Awards

Dr. Achillopoulou has won as an independent researcher a grant from the largest university of Europe (La Sapienza University) to conduct research on **structural health monitoring with guided waves**. This research project had been one amongst hundreds of competitor young researchers. Moreover, she leads voluntarily the Greek University student team to an International Summer Conference upon application. She also has been awarded the first prize, among eight countries including the USA, for the seismic performance of a 1:2 scaled timber model subjected to real seismic loads. Also, she was given an award for her excellent performance at the Greek National Exams for Admission at the University by one of the largest pharmaceutical companies worldwide (Sanofi-Aventis), as follows:

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|------|---|--------------|
| 2016 | ● Project for Young Researchers , La Sapienza University of Rome, 'Dynamic characterization of materials and 3D visualization of discontinuities in solid media.' [among hundreds of applications] | 4.000 € |
| 2016 | ● Join International Summer Conference of Civil Engineering Students (ISUCCES) 2016, first prize, Leader of the Greek team [among eight (8) countries] | Travel grant |
| 2004 | ● Sanofi- Aventis, University Admission Prize & First-Class Honors Prize (top 10% of candidates) | 10.000 € |
| 2003 | ● Sanofi- Aventis, First-Class Honors Prize (top 10% of candidates) | 2.000 € |



Other skills



Languages: English (Proficient user), French (Advanced user), Italian (Proficient user), Greek (native)



Computer skills: Nonlinear finite element analysis and data processing software (Abaqus, SAP2000, ANSYS Workbench, APDL, OpenSees, DRAIN 3DX, RISA 3DX, Labview, Mathematica, Response-2000, Xtract), Cad methods: AutoCAD, MatLab, Adobe Suite (InDesign, Illustrator, Photoshop), Microsoft Office/Windows, SmartDraw



Reviewing responsibilities

Journals: American Concrete Institute Structural Journal, Construction and Building Materials, Journal of Reinforced Plastics and Composites, Structures and Buildings, Journal Advances in Civil Engineering