Advanced electromagnetic materials and surfaces for novel wave phenomena

Advanced engineered materials and surfaces (e.g. metamaterials and metasurfaces) are making a revolution in many scientific fields (electromagnetics, acoustics, mechanics, etc.) due to the anomalous interaction between electromagnetic/acoustic/mechanical waves and the inherent structure of the artificial materials and surfaces. Such anomalous interaction allows controlling and processing the field in a unique way, opening the door to the design of conceptually new and unprecedented components. In electromagnetics, the new degrees of freedom offered by artificial materials and surfaces allows overcoming some of the issues in silicon electronics, giving raise to a new electronics enabled by the electromagnetic field, extending the concept of metamaterials, as originally put forward by N. Engheta some years ago. Making material properties reconfigurable and dynamically controllable in space and time, in fact, would open a myriad of new applications and scientific explorations. The course aims at presenting the recent advances in this new branch of electromagnetics, through the lectures given by eminent scientists and experts in the field.

The course is aimed at MS and PhD research students in Physics, Material Science, and Engineering, academic and industrial experts.

<table>
<thead>
<tr>
<th>Dates</th>
<th>18-22 December 2017</th>
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<tbody>
<tr>
<td>Venue</td>
<td>“Roma Tre” University, Rome, Italy</td>
</tr>
<tr>
<td>Credits earned</td>
<td>1.5 ECTS credits</td>
</tr>
<tr>
<td>Web</td>
<td><a href="http://school.metamorphose-vi.org">http://school.metamorphose-vi.org</a></td>
</tr>
<tr>
<td>Contact</td>
<td><a href="mailto:filiberto.bilotti@uniroma3.it">filiberto.bilotti@uniroma3.it</a></td>
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<tr>
<td>Poster presentation</td>
<td>Yes</td>
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<tr>
<td>Travel grants</td>
<td>2</td>
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</tbody>
</table>

**LECTURERS**

- Prof. Andrea Alù – University of Texas at Austin, USA
- Prof. Filiberto Bilotti – “Roma Tre” University, Italy
- Prof. Vincenzo Galdi – University of Sannio, Italy
- Prof. Silvio Hrabar – University of Zagreb, Croatia
- Prof. Stefano Maci – University of Siena, Italy
- Prof. Francesco Monticone – Cornell University, USA
- Prof. Matteo Rinaldi – Northeastern University, USA
- Prof. Carsten Rockstuhl – Karlsruhe Institute of Technology, Germany
- Prof. Mario Silveirinha – University of Lisbon, Portugal
- Prof. Alessandro Toscano – “Roma Tre” University, Italy
- Prof. Sergei Tretyakov – Aalto University, Finland

**Registration:**
Deadline 30 November 2017
http://school.metamorphose-vi.org

**Address:**
“Roma Tre” University – Dept. of Engineering – Via Vito Volterra 62 – 00144 Rome - Italy
18 December – Monday
09:00-09:55 Participant registration
09:55-10:00 Welcome and opening
10:00-11:00 Lecture 1 - The past, present, and future of active metamaterials and metasurfaces – Part I
   Prof. Silvio Hrabar – Zagreb University
11:00-11:30 Break
11:30-12:30 Lecture 2 - The past, present, and future of active metamaterials and metasurfaces – Part II
   Prof. Silvio Hrabar – Zagreb University
12:30-14:30 Lunch
14:30-15:30 Lecture 3 - Quantifying the T-matrix of a scattering object and exploring advanced material properties with it – Part I
   Prof. Carsten Rockstuhl – Karlsruhe Institute of Technology
15:30-16:00 Break
16:00-17:00 Lecture 4 - Quantifying the T-matrix of a scattering object and exploring advanced material properties with it – Part II
   Prof. Carsten Rockstuhl – Karlsruhe Institute of Technology
17:00-19:00 Self-study

19 December – Tuesday
09:30-10:30 Lecture 5 - Nonlocal, non-Hermitian, and multiphysics extensions of coordinate transformation-based design approaches – Part I
   Prof. Vincenzo Galdi – University of Sannio
10:30-11:00 Break
11:00-12:00 Lecture 6 - Nonlocal, non-Hermitian, and multiphysics extensions of coordinate transformation-based design approaches – Part II
   Prof. Vincenzo Galdi – University of Sannio
12:00-12:30 Assignments
12:30-14:30 Lunch
14:30-15:30 Lecture 7 - Scattering engineering at the extreme: Anomalies, singularities, and physical bounds in passive and active meta-structures – Part I
   Prof. Francesco Monticone – Cornell University
15:30-16:00 Break
16:00-17:00 Lecture 8 - Scattering engineering at the extreme: Anomalies, singularities, and physical bounds in passive and active metasstructures – Part II
    Prof. Francesco Monticone – Cornell University
17:00-19:00 Self-study

20 December – Wednesday
09:30-10:30 Lecture 9 - Non-reciprocal and topological electromagnetics, mechanics and acoustics – Part I
    Prof. Andrea Alù – University of Texas at Austin
10:30-11:00 Break
11:00-12:00 Lecture 10 - Non-reciprocal and topological electromagnetics, mechanics and acoustics – Part II
    Prof. Andrea Alù – University of Texas at Austin
12:00-13:00 Poster presentation by students
13:00-14:30 Lunch
14:30-15:30 Lecture 11 - “One-way” light propagation: topological and PTD-symmetric photonic platforms – Part I
    Prof. Mario Silveirinha – University of Lisbon
15:30-16:00 Break
16:00-17:00 Lecture 12 - “One-way” light propagation: topological and PTD-symmetric photonic platforms – Part II
    Prof. Mario Silveirinha – University of Lisbon
17:00-19:00 Self-study
20:00-22:00 Social dinner

21 December – Thursday
09:30-10:30 Lecture 13 - Materiatronics: Modular approach to understanding and design of metamaterials and metasurfaces – Part I
    Prof. Sergei Tretyakov – Aalto University
10:30-11:00 Break
11:00-12:00 Lecture 14 - Materiatronics: Modular approach to understanding and design of metamaterials and metasurfaces – Part II
    Prof. Sergei Tretyakov – Aalto University
13:00-14:30 Lunch
14:30-15:30 Lecture 15 - Synthesis-cycle of metasurfaces by flat optics and method of moments – Part I
    Prof. Stefano Maci – University of Siena
15:30-16:00 Break
16:00-17:00 Lecture 16 - Synthesis-cycle of metasurfaces by flat optics and method of moments – Part II
    Prof. Stefano Maci – University of Siena
22 December – Friday

09:30-10:30 Lecture 17 - **Plasmonically-enhanced Microelectromechanical Systems**  
*Prof. Matteo Rinaldi – Northeastern University*

10:30-11:00 Break

11:00-12:00 Lecture 18 - **Linear and non-linear metasurfaces: From cloaking to enabling smartness in EM components and devices – Part I**  
*Prof. Filiberto Bilotti – “Roma Tre” University*

12:00-13:00 Exams

13:00-14:30 Lunch

14:30-15:30 Lecture 19 – **Linear and non-linear metasurfaces: From cloaking to enabling smartness in EM components and devices – Part II**  
*Prof. Filiberto Bilotti – “Roma Tre” University*

15:30-16:00 Break

16:00-17:00 Lecture 20 – **Research activities on metamaterials and metasurfaces developed at “Roma Tre” University**  
*Prof. Alessandro Toscano – “Roma Tre” University*