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Department	School of Engineering and the Built Environment
Supervisors	Naser Ojaroudi Parchin, Chan Hwang See
Funding Status	Funded PhD Project (Worldwide)
Application Deadline	14/04/2022
Project Title	Development of Intelligent Meta-Surfaces for 5G/6G Beamforming
<p>PROJECT DESCRIPTION</p> <p>The explosive growth in the demand for high speed and low power consumption wireless technologies has long made researchers struggle to come up with the technology that would upscale well with the ever-rising computational demands. Today's transmitters/receivers still rely on the conventional architecture which leads to extremely high hardware costs and power consumption. Therefore, new concepts such as intelligent meta-surfaces are highly desirable. The intelligent meta-surfaces are software-controlled planer surfaces that constitutes multiple reconfigurable metamaterial elements. Through the unprecedented control over the EM waves, they have led to significant breakthroughs in various wireless fields such as sensing, imaging, communications, or radar.</p> <p>The goal of this PhD project is to develop cutting-edge meta-surfaces with novel design and driven techniques for 5G/6G networks. The targeting meta-surface antenna systems will be characterized by system-level simulation tools such as CST, ADS and MATLAB. To achieve various functionalities, artificial intelligence (AI) tools will be adopted. The designs with better performances will be implemented and measured under different scenarios.</p> <p>Academic qualifications</p> <p>A first degree (at least a 2.1) ideally in in M.Sc. degree with distinction in Electrical engineering, Electromagnetics, Materials Science or Physics with a good fundamental knowledge of Antennas.</p> <p>English language requirement</p> <p>IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. Full details of the University's policy are available online.</p> <p>Essential attributes:</p> <ul style="list-style-type: none">• Experience of fundamental Electromagnetics, Microwave Engineering and Antennas• Competent in Signal Processing and CAD tools• Knowledge of RF and microwave beamforming• Good written and oral communication skills• Strong motivation, with evidence of independent research skills relevant to the project• Good time management <p>Desirable attributes:</p> <p>Solid experience in RF and antenna systems with a Track record of publishing in high-quality Journals and International Conferences.</p>	
Indicative Bibliography	<p>[1] S. B. Glybovski, S. A. Tretyakov, P. A. Belov, Y. S. Kivshar, and C. R. Simovski, "Metasurfaces: From microwaves to visible," Phys. Rep., vol. 634, pp. 1–72, May 2016.</p> <p>[2] S. Abadal, T. Cui, T. Low and J. Georgiou, "Programmable Metamaterials for Software-Defined Electromagnetic Control: Circuits, Systems, and Architectures," in IEEE Journal on Emerging and Selected Topics in Circuits and Systems, vol. 10, no. 1, pp. 6-19, March 2020.</p> <p>[3] O. Tsilipakos, et al., Toward Intelligent Metasurfaces: The Progress from Globally Tunable Metasurfaces to Software-Defined Metasurfaces with an Embedded Network of Controllers. Adv. Optical Mater. 2020, 8, 2000783.</p>

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	[4] J. Y. Dai et al., "Wireless Communication Based on Information Metasurfaces," in IEEE Transactions on Microwave Theory and Techniques, vol. 69, no. 3, pp. 1493-1510, March 2021.
Funding notes	This project may be funded by a scholarship of the School of Engineering and Built and Environment. Please see School-funded PhD scholarships - RESEARCH AND INNOVATION (napier.ac.uk) for information on the scholarships and how to apply for them.
Enquiries	For informal enquiries about this PhD project, please contact Dr Naser Ojaroudi Parchin, n.ojaroudiparchin@napier.ac.uk
Web page	https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process

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