# CI9.S.2.2 Systems approaches to reliability and resilience

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| Term: | Spring |
| Contact hours: | 25 |
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## 1.0 Aims

This module aims to provide the student with an overview of wired and wireless communication network technologies in built environments, including some on-hands experience of such networks.

Every modern built environment now requires an installed communication infrastructure, both for wired and wireless communications. Wired communications will generally provide the greater reliability and security, as well as potentially higher bandwidths with less intermittency, while wireless communications will offer greater ease and variability of deployment; both of these sets of characteristics are generally desirable so that both modalities will often be sought. This module will provide an overview of these technologies as well as of the Quality of Service that one can expect from them. It will also offer the MSc students with a hands-on laboratory experience regarding the engineering principles of networks deployment and measurement.

## 2.0 Syllabus

Sensing and control systems for the built environment have to work at large scale and with rich functionality; which leads to high complexity both in terms of design and run-time operation. This module therefore examines the nature of this complexity and the ways that systems can be designed to manage the complexity automatically.

* Risk and security in IT systems  
  - Communication network principles   
  - Communication network laboratory
* Cyber security
* Self-managing, autonomic and context-aware systems
* Nature-inspired techniques for self-organisation in sensor systems

## 3.0 Intended learning outcomes

* The idea of systems Quality
* Hands on experience of data systems
* The concepts of autonomic computing, self-management and self-organisation in systems
* Experience of self-managing and self-organising systems through modelling experiments

## 4.0 Assessment

* Assessment of this module is in the form of progress tests usually given as in class group work.
* There is one piece of Coursework associated with this module worth 5%. This needs to be completed successfully in order to complete this module.

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## 5.0 Recommended reading

C = Core, S = Supplementary

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| C | Anthony, R. J. Policy-based autonomic computing with integral support for self-stabilisation, *International Journal of Autonomic Computing*, Vol. 1, No. 1, pp.1-33. ISSN (Online): 1741-8577, ISSN (Print): 1741-8569, 2009, Inderscience. |
|  | R. J. Anthony, D. Chen, M. Törngren, D. Scholle, M. Sanfridson, A. Rettberg, T. Naseer, M. Persson, L. Feng, Autonomic Middleware for Automotive Embedded Systems, chapter 7 in (A. Vasilakos, M. Parashar, S. Karnouskos, W. Pedrycz, editors) *Autonomic Communication*, pp. 169-210, Hardcover, ISBN: 978-0-387-09752-7. Springer, September 2009. <http://www.springer.com/computer/communications/book/978-0-387-09752-7> |
|  | Anthony R, Agile Parallel Applications, *International Journal of Computer Mathematics*, 84 (2), February 2007, pp. 153–166, Taylor & Francis |
|  | Anthony. R, Emergence: A Paradigm for Robust and Scalable Distributed Applications, 1st Intl. Conf. Autonomic Computing (ICAC), IEEE, New York, 2004, pp.132-139. |
|  | Anthony R, Butler A, Ibrahim M, Exploiting Emergence in Autonomic Systems, in (Parashar M, Hariri S, editors) *Autonomic Computing: Concepts, Infrastructure, and Applications*, pp. 121-148, CRC press (Taylor and Francis group), 2007, USA. |
|  | Anthony R, Emergent Graph Colouring*, Engineering Emergence for Autonomic Systems (EEAS), First Annual International Workshop*, at the 3rd Intl. Conf. on Autonomic Computing (ICAC), Dublin, Ireland, June, 2006, pp. 4-13, CMS press. |
|  | R. Anthony and J. McCann, Emergent self-organisation of wireless sensor networks, *Second International Workshop on Engineering Emergence in Decentralised Autonomic Systems* (EEDAS 2007) at the *Fourth IEEE International Conference* |
|  | M. Breza, R. Anthony and J. McCann, Scalable and efficient sensor network self-configuration in BioANS, *First IEEE Intl. Conf. on Self-Adaptive and Self-Organizing Systems* (*SASO*), Boston, Mass., USA, July, 2007, IEEE. pp.351-354 |
|  | Anthony R, Pelc M, and Shuaib H, The Interoperability Challenge for Autonomic Computing, The Third International Conference on Emerging Network Intelligence (EMERGING 2011), Lisbon, Portugal, November 20-25, 2011, pp. 13-19, IARIA, ISBN 978-1-61208-174-8. |