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## PREFACE

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The present issue contains a selection of edited papers presented at the Conference on High Performance and Optimum Design of Structures and Methods held at the University of Siena and co-organised by the Wessex Institute, UK, the Free University of Brussels and the University of A Coruña in Spain.

The issue contains papers on advanced types of structures, based on new design concepts. Modern structural design requires the development of new methods that can lead to systems able to resist a range of external stimuli. Particular emphasis is being placed on intelligent structures and materials.

Modern materials used in engineering components of structures are required to withstand a wide range of external stimuli. These range from high temperatures to special materials for restoration of heritage structures. Textile structures are usually highly stressed but they must result in minimal creep or relaxation for instance. Current research is also focused on their durability, which allows them to operate properly during their required lifetime.

Structural engineers must find adequate answers to the challenges of contemporary civil architecture, very often being a combination of lightweight structures with large spans. This requires sophisticated calculation techniques, including non-linear and vibration behaviour. These new challenges require analysis, not only in terms of ultimate strength, serviceability and limit states but also in terms of their reliability and integrity. The engineer is also faced with the need to design ecological friendly structures to reduce their environmental impacts and incorporate reasonable resources.

The development and application of modern computational methods and powerful computers for structural modelling, control and management has increased the probabilities of using graphic interfaces and the incorporation of optimisation in the design process.

Some of the contributions in this issue are devoted to theoretical advances and practical applications of optimum design methodologies to several engineering disciplines. They demonstrate the current maturity of this design technique that has evolved with time from academic research to become a tool, useful to practising engineers. In fact, papers included in this issue originate not only from universities and research institutions but also from engineering companies. The papers are related to optimization of concrete and steel bridges, special structures and mechanical engineering. The problems formulated are very diverse and include size, shape and topology optimization, composite materials and a variety of nonlinear analysis.

Re-use and recyclability of materials and structural components is becoming increasingly important, i.e. supporting the “cradle to cradle” approach. Re-use is also found nowadays in two levels, not only from the re-use of structural components and materials but also the transformation of complete buildings, such as offices into schools or residential accommodation.

The papers included in this issue reflect these advances and provide a state of the art view of some of the most recent advances in high performance structures and materials. They are published by WIT Press and available Open Access in the eLibrary of the Institute ([witpress.com/elibrary](http://witpress.com/elibrary)) where they can be downloaded for free by the international community.

The Editors are grateful to the authors for their papers and to the reviewers for their help in ensuring the quality of the contents of this issue.

*The Editors*  
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