

## Preface

The idea of this special issue was to gather a number of papers on the fields of mechanics, materials and energy. Of course the selected topics were targeted so that the readers do not differ when perusing the articles included in this issue. The latter enables to clarify the views on the progress that has been made on the above-mentioned topics and to contribute to the enhancement of the related findings. For this purpose, we decided to focus on the key topics dealing with the capability of theoretical and numerical approaches to describe the elasto-plastic behaviour of both metallic and composite materials. For instance, the lifetime of composite materials was predicted using the static damage and damage by the unified theory. These investigations will help in predicting the life duration and the reliability of structures, optimising in-service inspections of structural components and mainly avoiding catastrophic failures. Mechanical characterisation was achieved under various loadings and environments to investigate the behaviour of the materials. The obtained parameters were introduced to simulate the response of structures through finite element analysis used in different applications such as wire rope strands and cutting tools. Fatigue crack growth and propagation using modern numerical techniques and energy-based criteria was investigated and compared to experimental results. Moreover, the effect of microstructure and viscoplasticity on the evolution of isotropic and kinematic hardening under cyclic loading was explored. In addition, the influence of orientation and local materials on the energy needs for buildings was elucidated based on recent real data.

Guest Editor Prof. Mohammed Abbadi