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## Contributions to the Multiperiod Production Planning of Heterogeneous Prestressed Precast Beams

In this work, we introduce two novel variants of cutting scheduling problems named Heterogeneous Prestressed Precast Beam Multiperiod Production Planning (HPPBMPP) and Cutting and Packing Heterogeneous Prestressed Precast Beam Multiperiod Production Planning (CP-HPPBMPP). A prestressed precast beam is a type of beam that is stretched with traction elements in order to improve its resistance and behavior in service. Such beams can be of different lengths, types, and potentially require different curing times. The HPPBMPP consists of planning the usage of the available set of molds within a given time horizon to fulfill the beam demand of a set of clients. On the other hand, the CP-HPPBMPP addresses the integration of the cutting phase of traction elements (in this study we use bars), which are used in the production of the beams, considering the usage and generation of leftovers, as well as overlapping bars. We propose integer linear programming (ILP) models for both problems, in addition to alternative solution methods, such as size-reduction heuristics, priority rules, and genetic algorithms. We argue the NP-hardness of both problems and explore some of their properties, including lower bounds for optimal objective function values and the use of maximal patterns. We carry out computational tests with the exact solution of the ILP models and the alternative solution methods proposed. We conclude with a discussion of the relative merits of the proposed approaches in terms of solution quality.

### **Palestrante: Kennedy Anderson Guimarães de Araújo**

Possui graduação em Matemática Industrial pela Universidade Federal do Ceará (2017) e é mestrando em Modelagem e Métodos Quantitativos pela mesma Universidade. Tem experiência acadêmica na área de Engenharia de Produção, com ênfase em Pesquisa Operacional. Tem experiência com programação e com softwares de otimização para programação linear, inteira e por restrições, simulação estocástica e bancos de dados

### **Local de Realização:**

Sala de Reuniões do DEMA  
Bloco 910 - 1º andar  
Campus do Pici, UFC  
Mapa do Campus:  
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#map=19/-3.74603/-38.57425](https://www.openstreetmap.org/#map=19/-3.74603/-38.57425)

### **Mais informações:**

E-mail: [mmq@dema.ufc.br](mailto:mmq@dema.ufc.br)  
Telefones: (85) 33669156 ou  
(85) 33669840  
Site: <http://www.mmq.ufc.br/>

