



Merica



25-28 Aug 2015

## MISTA 2015 PROCEEDINGS



25 -28 Aug 2015 | Prague, Czech Republic  
ISSN: 2305-249X

# MISTA 2015

Proceedings of the

## **7<sup>th</sup> Multidisciplinary International Conference on Scheduling: Theory and Applications**

25<sup>th</sup> – 28<sup>th</sup> August 2015  
Prague, Czech Republic

*Edited by*

**Zdenek Hanzálek**, Czech Technical University in Prague

**Graham Kendall**, University of Nottingham, UK/Malaysia

**Barry McCollum**, Queens University Belfast, UK

**Premysl Šůcha**, Czech Technical University in Prague

## Table of Contents

### Plenary Presentations

Rudová H. <i>University course timetabling: From theory to practice</i> .....	12
Skutella M. <i>LP-based algorithms for scheduling unrelated parallel machines</i> .....	13
Hurink J. <i>Scheduling for Decentralized Energy Management</i> .....	14

### Papers

Adasme P., Leung J. and Lisser A. <i>A Probabilistic Constrained Approach for Unrelated Parallel Machine Scheduling</i> .....	16
Mountakis S., Klos T., Witteveen C. and Huisman B. <i>Exact and heuristic methods for trading-off makespan and stability in stochastic project scheduling</i> .....	25
Glizer V.Y. and Turetsky V. <i>Optimal schedule of a statistical process control with a nonlinear expected loss</i> .....	42
Ishii R. and Nakagawa K. <i>Scheduling competition in the airline industry and the issue of duplicate bookings</i> .....	55
Bhattacharya S. and Bose S.K. <i>Continuous Time Model for Scheduling Operations in Cascaded Continuous Processing Units with Multiple Due Dates</i> .....	63
Thörnblad K., Strömberg A-B., Patriksson M. and Almgren T. <i>Scheduling optimization of a real flexible job shop including side constraints regarding maintenance, fixtures, and night shifts</i> .....	78
Harbering J., Ranade A. and Schmidt M. <i>Single Track Train Scheduling</i> .....	102
Kemmoé-Tchomé S., Lamy D. and Tchernev N. <i>An Optimization Framework for Job-shop with Energy Threshold Issue with Consideration of Machining Operations with Consumption Peaks</i> .....	118
Mauergauz Y. <i>Production Scheduling Based on Order Utility Functions</i> .....	134
Marszałkowski J. and Drozdowski M. <i>Energy Consumption in Single- and Multi-installment Divisible Loads Processing in Systems with Hierarchical Memory</i> .....	146
Nourmohammadzadeh A. and Hartmann S. <i>An Efficient Simulated Annealing for the Integrated Problem of Berth Allocation and Quay Crane Assignment in Seaside Container Terminals</i> .....	154
Tavares-Neto R.F. and Ogawa M.A. <i>A constructive heuristic to reduce costs on an integrated production-distribution environment</i> .....	165
Fu L-L., Aloulou M.A. and Triki C. <i>Integrated production and outbound distribution scheduling problem with setup times and delivery time windows</i> .....	174

Bouyahia Z. <i>Stability of probabilistic scheduling problems with precedence constraints and weighted completion time objective</i> .....	189
Akrotirianakis I. and Chakraborty A. <i>An optimization-based approach for delivering radio-pharmaceuticals to medical imaging centers</i> .....	203
Pimenta V., Quilliot A., Toussaint H. and Vigo D. <i>Reliability Oriented DARP Models Involving Autonomous Vehicles</i> .....	218
Muguerza M., Briand C., Jozefowicz N., Ngueveu S.U., Rodríguez V. and Moris M.U. <i>A mass-flow MILP formulation for energy-efficient supplying in assembly lines</i> .....	236
Tran T.T., Zhang P.Y., Li H., Down D.G. and Beck J.C. <i>Resource-Aware Scheduling for Data Centers with Heterogenous Servers</i> .....	240
Lach M., Lach G. and Zorn E. <i>Examination timetabling at Technische Universität Berlin</i> ..	260
Fonseca G.H.G., Santos H.G. and Carrano E.G. <i>Improving Upper Bounds in High School Timetabling by Matheuristics</i> .....	267
Gunawan A., Lau H.C. and Lu K. <i>SAILS: Hybrid Algorithm for the Team Orienteering Problem with Time Windows</i> .....	276
Akhavizadegan F., Tavakkoli-Moghaddam R., Jolai F. and Ansarifard J. <i>Cross-training performance of nurse scheduling with the learning effect</i> .....	296
Ilani H., Shufan E. and Grinshpoun T. <i>A Fixed Route Dial-a-Ride Problem</i> .....	313
Benmansour R., Braun O. and Allaoui H. <i>Modeling the single-processor scheduling problem with time restrictions as a parallel machine scheduling problem</i> .....	325
Höner J., Lach G. and Zorn E. <i>An IP-based Model for the Post-Enrollment-based Course Timetabling Problem at TU Berlin</i> .....	331
Singh R. and Mathirajan M. <i>Simulation Based Cause and Effect analysis of Input Variables in Wafer Fabrication</i> .....	345
Klöcker C., Ostler J. and Wilke P. <i>Optimisation of Staff Absences</i> .....	360
Lach G., Lach M. and Zorn E. <i>Solving Huge Real-World Timetabling Instances</i> .....	370
Quesnelle J. and Steffy D. <i>Scheduling a conference to minimize attendee preference conflicts</i> .....	379
Hidri L. and Gazdar A. <i>Bounding schemes for the parallel processors scheduling problem with release date, delivery time and with no-idle time constraint</i> .....	393
Hidri L., Ben Youssef B. and Gazdar A. <i>Lower bounds for the parallel processing scheduling problem with multiprocessor tasks, release date and delivery time</i> .....	403
Althaus E. and Muttray U. <i>University Course Timetabling with Conflict Minimization and Elective Courses: A Decomposition-Based Approach to a Real-Life Case</i> .....	412
Rahimian E., Akartunali K. and Levine J. <i>A Hybrid Constraint Integer Programming Approach to Solve Nurse Scheduling Problems</i> .....	429

García-León A., Dauzère-Pérès S. and Mati Y. <i>Minimizing regular criteria in the flexible job-shop scheduling problem</i> .....	443
Wilmer D. and Klos T. <i>Robustness of Partial Order Schedules: Understanding the Chaining algorithm</i> .....	457
Perez-Gonzalez P., Dios M., Fernandez-Viagas V. and Framinan J.M. <i>Heuristic Methods for Single Machine Scheduling with Periodic Maintenance</i> .....	473
Kozik A. and Rudek R. <i>A novel Approximate/Exact objective based search technique for precedence constrained scheduling problems</i> .....	484
Krivulin N. <i>Tropical optimization problems in project scheduling</i> .....	492
Battistutta M., Ceschia S., De Cescio F. and Schaerf A. <i>Thesis Defense Timetabling</i> .....	507
Shaker K., Abdullah S. and Alqudsi A. <i>Bacteria Swarm Optimisation Approach for Enrolment-Based Course Timetabling Problems</i> .....	515
Rihm T. and Baumann P. <i>A lexicographic goal programming approach for staff assignment with acceptance levels</i> .....	526
Zimmermann A. and Trautmann N. <i>A list-scheduling approach for the planning of assessment centers</i> .....	541
Yuan Z. and Fügenschuh A. <i>Home Health Care Scheduling: A Case Study</i> .....	555
Brandão J.S., Noronha T.F., Resende M.G.C. and Ribeiro C.C. <i>A biased random-key genetic algorithm for scheduling divisible loads</i> .....	570
Weedon R, Ahmadi S. and Critchley M. <i>Optimisation of a Stagger Chart for Aviation Fleet Planning</i> .....	579

## Abstracts

Prajapat N., Hutabarat W., Tiwari A. and Pattacini M. <i>Investigating Scheduling models for Power Plant Preventive Maintenance using Genetic Algorithm</i> .....	591
Shikata Y. and Hanayama N. <i>Routing Strategy for Prioritized Limited Multi-server Processor-Sharing System that includes Servers with Various Capacities</i> .....	596
Choi J.Y. <i>An efficient simulated annealing for two-agent scheduling with exponential job-dependent position-based learning consideration</i> .....	601
Baron O., Berman O., Krass D. and Wang J. <i>Strategic Idling and Dynamic Scheduling in Open-Shop Service Network: Case Study and Analysis</i> .....	604
Lindahl M., Sørensen M. and Stidsen T. <i>A Matheuristic for Curriculum-Based Course Timetabling</i> .....	606
Fernandes P. and Barbosa A. <i>Solving the staff scheduling problem in a retail company</i> .....	611

Struijker Boudier I., Glazebrook K., Wright M. and Jennings P. <i>Ant Colony Optimisation for a Job Shop with Flexible Maintenance</i> .....	614
Drwal M. <i>Complexity of minimizing the total flow time on parallel machines with interval data and minmax regret criterion</i> .....	617
Van Marcke K. and Ali O. <i>Scheduling the operation of a phosphate pipeline for OCP: A Case Study</i> .....	622
Karhi S. and Shabtay D. <i>Online and semi-online scheduling of two job types on a set of multipurpose machines</i> .....	626
Shabtay D., Yedidsion L. and Lisovoy A. <i>The resource dependent assignment problem with a convex assignment cost function and its relation to scheduling with controllable processing times</i> .....	629
Detienne B., Sadykov R. and Tanaka S. <i>The two-machine flowshop total completion time problem: A branch-and-bound based on Network-flow formulation</i> .....	635
Volk R., Hübner F. and Schultmann F. <i>Robust multi-mode resource constrained project scheduling of building deconstruction under uncertainty</i> .....	638
Lange J. <i>Approaches to modeling job-shop problems with blocking constraints</i> .....	645
Gorczyca M., Janiak A. and Lichtenstein M. <i>A dynamic model of task processing for scheduling problems without additional resources</i> .....	649
Desrosiers J., Gauthier J.B. and Lübbecke M.E. <i>Vector space decomposition for linear programming</i> .....	652
Baykasoglu A. and Ozsoydan F.B. <i>A GRASP based approach to dynamic scheduling of parallel heat treatment furnaces in a manufacturing company</i> .....	656
Heßler C. and Deghdak K. <i>The Discrete Parallel Machine Makespan Scheduling-Location Problem</i> .....	659
Bukata L., Šůcha P. and Hanzálek Z. <i>A new lower bound for optimisation of energy consumption of robotic cells</i> .....	662
Maenhout B., Burgelman J. and Vanhoucke M. <i>A heuristic procedure for the personnel task re-scheduling problem</i> .....	666
Ingels J. and Maenhout B. <i>A heuristic procedure to proactively increase employee substitutability and personnel roster robustness</i> .....	669
Chen B., Coffman E., Dereniowski D. and Kubiak W. <i>Structural properties of an open problem in preemptive scheduling</i> .....	673
Horváth M. and Kis T. <i>Solving resource constrained shortest path problems with branch-and-cut</i> .....	677
Sahli A., Carlier J. and Moukrim A. <i>Lower bounds for Scheduling Problems with production and consumption of resources</i> .....	680

Wachtel G. and Elalouf A. <i>"Floating Patients" method based on Scheduling algorithm for emergency department's service improvement</i> .....	683
Stockwell-Alpert E. and Chung C. <i>Fairness in employee scheduling</i> .....	687
Makatun D., Lauret J., Rudová H. and Šumbera M. <i>Model for planning of distributed data production</i> .....	699
Deghdak K. and T'Kindt V. <i>A Decomposition Heuristic for a Bicriteria Evacuation Scheduling Problem</i> .....	704
Almakhlafi A. and Knowles J. <i>Iterated Local Search for the Generator Maintenance Scheduling Problem</i> .....	708
Levner E. and Elalouf A. <i>A general technique for improving the complexity of FPTAS for scheduling problems</i> .....	743
Shen L. and Gupta J.N.D. <i>Family Scheduling in Flow Shop Manufacturing Systems with Batch Availability</i> .....	746
Bronnikov S., Gushchina V., Lazarev A., Morozov N., Sologub A. and Yadrentsev D. <i>Three approaches to solving the problem of cosmonauts' training planning</i> .....	750
Shang L., Lenté C., Liedloff M. and T'Kindt V. <i>An exponential dynamic programming algorithm for the 3-machine flowshop scheduling problem to minimize the makespan ....</i>	755
Novák A., Václavík R., Šůcha P. and Hanzálek Z. <i>Nurse Rostering Problem: Tighter Upper Bound for Pricing Problem in Branch and Price Approach</i> .....	759
Fernandez-Viagas V., Dios M., Perez-Gonzalez P. and Framinan J.M. <i>A framework of constructive heuristics for permutation-type scheduling problems</i> .....	764
Dios M., Fernandez-Viagas V., Perez-Gonzalez P. and Framinan J.M. <i>Manufacturing Scheduling Systems: What are they made of?</i> .....	768
Ackermann H., Küfer K-H., Leithäuser N., Meyer A. and Velten S. <i>How to Unload Bulk Carriers Quickly? Mathematical Models to Identify Efficient Loading Patterns</i> .....	772
Menezes G.C., Mateus G.R. and Ravetti M.G. <i>Scheduling with incompatible jobs: model and algorithms</i> .....	776
Macedo R., Benmansour R., Urošević D., Artiba A. and Mladenović N. <i>Scheduling preventive railway maintenance activities with resource constraints</i> .....	782
Ionescu L. and Kliwer N. <i>Stability and Flexibility of Crew and Aircraft Schedules</i> .....	785
Knopp S., Dauzerè-Pérès S. and Yugma C. <i>Scheduling Complex Job-Shops using Batch Oblivious Disjunctive Graphs: A Scheduling Approach for the Diffusion and Cleaning Area in Semiconductor Manufacturing</i> .....	788
Pham S. and De Causmaecker P. <i>The Intermittent Traveling Salesman Problem</i> .....	794
Lazarev A., Arkhipov D. and Werner F. <i>Single machine scheduling: Finding the Pareto Set for jobs with equal processing times with respect to criteria <math>L_{max}</math> and <math>C_{max}</math></i> .....	797

Tan Y., Mönch L. and Fowler J. <i>Scheduling Jobs in a Two-Stage Flexible Flow Shop with Batch Processing Machines</i> .....	801
Sucu S., Leggate A., Akartunah K. and Van Der Meer R. <i>Modeling Uncertainty in Vessel Crew Scheduling</i> .....	805
Borreguero Sanchidrián T., Artigues C., Sánchez A.G., Mier M.O. and Lopez P. <i>Multimode Time-Constrained Scheduling Problems with Generalized Temporal Constraints and Labor Skills</i> .....	809
Grigoreva N.S. <i>Multiprocessor Scheduling with Inserted Idle Time to Minimize the Maximum Lateness</i> .....	814
Herding R. and Mönch L. <i>Using Adaptive Large Neighborhood Search to Solve Parallel Machine Scheduling Problems with Dedications and Unequal Ready Times of the Jobs</i> .....	817
Adriaensen S., Fathy Y. and Nowé A. <i>On Task Scheduling Policies for Work-Stealing Schedulers</i> .....	821
Bagger N-C. F., Kristiansen S., Sørensen M. and Stidsen T. R. <i>Flow Formulation-based Model for the Curriculum-based Course Timetabling Problem</i> .....	825
Kirchner S. and Lübbecke M. <i>Appointment scheduling in hospitals: Sequencing and scheduling using timeaggregation</i> .....	849
Barták R. and Vlk M. <i>Resource Failure Recovery in Production Scheduling</i> .....	852
Afifi S. and Moukrim A. <i>Primal Heuristics for the Vehicle Routing Problem with Synchronized Visits</i> .....	859
Müller M., Ostler J. and Wilke P. <i>Comparison of EATTS and XHSTT - Towards a Unified Description Language for Timetabling Problems</i> .....	862
Seddik Y. and Hanzalek Z. <i>Mixed-criticality scheduling with known probabilities</i> .....	867
Arbaoui T., Azouni A., Boufflet J-P. and Moukrim A. <i>Student Scheduling Problem At Université de Technologie de Compiègne</i> .....	871
Akhlaghi V.E., Gultekin H. and Coban B. <i>Shortest k-unit Cycle in a Multiple Part-Type Robotic Cell</i> .....	876
Della Croce F., Garraffa M., Shang L. and T'Kindt V. <i>A branch-and-reduce exact algorithm for the single machine total tardiness problem</i> .....	879
van den Akker M., Hoogeveen H. and Lukkien J. <i>Maintenance planning in a stochastic job shop</i> .....	882
Marszałkowski J. <i>Budgeted Internet Shopping Optimization Problem (B-ISOP)</i> .....	885
Braune R. <i>Packing-based approaches for a discrete malleable task scheduling problem</i> .....	888
Riise A., Lamorgese L. and Mannino C. <i>Multi-level Benders Decomposition for Multi-modal Outpatient Scheduling in Hospitals</i> .....	892



Schilde M., Schneeberger K. and Doerner K. <i>Variable Neighborhood Search for a Rich Production Planning Problem</i> .....	896
Herr O. and Goel A. <i>Scheduling of jobs in the continuous casting stage of steel production</i> .....	899
Balasubramanian H., Fowler J. and Keha A. <i>The polynomial solvability of a bicriteria linear combination on parallel identical machines with release dates</i> .....	902
Soares J.A., Santos H.G., Baltar D.D. and Toffolo T.A.M. <i>LAHC applied to The Multi-Mode Resource-Constrained Multi-Project Scheduling Problem</i> .....	905
Pillay N. <i>Automated Design of the Developmental Approach for Solving the Examination Timetabling Problem</i> .....	909
Horn G. <i>Scheduling Time Variant Jobs on a Time Variant Resource</i> .....	914
Toffolo T.A.M., Wauters T. and Vanden Berghe G. <i>Time-based Decomposition Strategies for the Traveling Umpire Problem</i> .....	918
Östberg P-O. and McCollum B. <i>Heuristics and Algorithms for Data Center Optimization</i> .....	921
Smet P. and Vanden Berghe G. <i>Variable neighbourhood search for rich personnel rostering problems</i> .....	928
Fong C-W., Asmuni H., Lam W-S., McCollum B., McMullan P. and Kendall G. <i>A Hybrid Swarm Algorithm for Post Enrollment Course Timetabling</i> .....	931
Kasirzadeh A. and Soumis F. <i>An integrated simultaneous approach for pilots and copilots re-scheduling problem</i> .....	943
Van Den Dooren D., Sys T., Wauters T. and Vanden Berghe G. <i>Multi-objective energy-aware scheduling</i> .....	946
Hojati M. <i>A Greedy-based Heuristic for Shift Minimization Personnel Task Scheduling Problem</i> .....	949