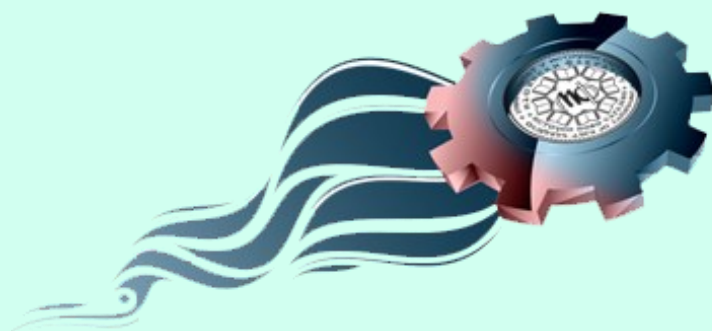




UNIVERSITY OF EAST SARAJEVO  
FACULTY OF MECHANICAL  
ENGINEERING



3<sup>rd</sup> INTERNATIONAL SCIENTIFIC CONFERENCE



***COMETa2016***

***„Conference on Mechanical Engineering  
Technologies and Applications“***

***PROCEEDINGS***

7<sup>th</sup>-9<sup>th</sup> December

East Sarajevo-Jahorina, RS, B&H

# COMET<sub>a</sub> 2016

3<sup>rd</sup> INTERNATIONAL SCIENTIFIC CONFERENCE

7<sup>th</sup> - 9<sup>th</sup> December 2016

Jahorina, Republic of Srpska, B&H



University of East Sarajevo

Faculty of Mechanical Engineering

Conference on Mechanical Engineering Technologies and Applications

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## **Z B O R N I K   R A D O V A**

## **P R O C E E D I N G S**

*Istočno Sarajevo – Jahorina, BiH, RS*  
*7 - 9. decembar 2016.*

*East Sarajevo – Jahorina, B&H, RS*  
*7<sup>th</sup> – 9<sup>th</sup> December 2016.*

ZBORNİK RADOVA SA 3. MEĐUNARODNE  
NAUČNE KONFERENCIJE  
"Primijenjene tehnologije u mašinskom inženjerstvu"  
COMETa2016, Istočno Sarajevo - Jahorina 2016.

PROCEEDINGS OF THE 3<sup>rd</sup> INTERNATIONAL  
SCIENTIFIC CONFERENCE  
"Conference on Mechanical Engineering  
Technologies and Applications"  
COMETa2016, East Sarajevo - Jahorina 2016.

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<i>Organizator:</i>	Univerzitet u Istočnom Sarajevu Mašinski fakultet Istočno Sarajevo
<i>Organization:</i>	University of East Sarajevo Faculty of Mechanical Engineering East Sarajevo
<i>Izdavač:</i>	Univerzitet u Istočnom Sarajevu Mašinski fakultet Istočno Sarajevo
<i>Publisher:</i>	University of East Sarajevo Faculty of Mechanical Engineering East Sarajevo
<i>Za izdavača:</i> <i>For publisher:</i>	Prof. dr Ranko Antunović
<i>Urednici:</i> <i>Editors:</i>	Prof. Dr Biljana Marković, Prof. Dr Ranko Antunović,
<i>Tehnička obrada i dizajn:</i> <i>Technical treatment and desing:</i>	Ranka Gojković, senior asisstant Nikola Vučetić, senior asisstant Aleksija Đurić, senior asisstant
<i>Izdanje:</i> <i>Printing:</i>	Prvo 1 <sup>st</sup>
<i>Register:</i> <i>Register:</i>	ISBN 978-99976-623-7-8 COBISS.RS-ID 6240280

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## PREFACE

*Production in developed countries is based on the modernization and optimization of the production processes with the application of new technologies that are the result of scientific research. The application of new technology enables company's efficient production and competitiveness in the world market.*

*Faculty of Mechanical Engineering, University of East Sarajevo, organizes the Third international conference "COMETa2016 - Conference on Mechanical Engineering Technologies and Application", which has tasks: to increase economic competitiveness in the region and to give an contribution to creation of unique European Research Area.*

*Globally, we are witnessing a rapid development and a host of new technological solutions, which occur primarily in the multidisciplinary development (mechatronics) but also in development of completely new technologies, such as nanotechnology, biomaterials, bioengineering, new energy sources, intelligent machines and processes, micro-technique, etc. All of this puts researchers and engineers in the new challenges and creates opportunities for products and technologies that provide a precondition for economic recovery and creation of new jobs.*

*COMETa2016 conference program structure is consisted of the following thematic areas: Production technologies and advanced materials, Energy and environment, Applied mechanics and mechatronics, Development of products and mechanical systems, Quality and management and Organization and maintenance.*

*Participation in international conference COMETa2016 was achieved by: 202 authors from 9 countries, with a total of 78 papers, including 3 plenary lectures.*

*Inside of conference COMETa2016 has been planned organization of one working meeting and two round table discussion based on actual topics of conference. During the conference, it will be presented some of technical solutions produced in companies from our region.*

*The presence of a large number of participants from Bosnia and Herzegovina and abroad as well as the problems which are processed at the conference, coincide with the themes promoted by the European Union in its development programs.*


*On the basis of previous exposure, a gathering of scientists and researchers at the international conference COMETa should be understood not only as an exchange of knowledge and achievements of the narrower set of scientists and researchers, but also as a constant and serious attempt to focus social consciousness and social life on activities that ensures progress and prosperity of any society, and that is productive work, creating new knowledge and economic development.*

*On behalf of the Organizing Committee and Scientific Committee of the Conference COMETa2016, we want to express our gratefulness to all authors, reviewers, as well as institutions, companies and individuals who contributed to realization of the Conference.*

*East Sarajevo, November 19<sup>th</sup>, 2016.*

*President of the Scientific Committee*

*Prof. dr Biljana Marković*



*President of the Organizing Committee*

*Prof. dr Ranko Antunović*





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CIP - Каталогизација у публикацији  
Народна и универзитетска библиотека  
Републике Српске, Бања Лука

621.03(082)(0.034.4)

МЕЂУНАРОДНА научна конференција "Примијењене  
технологије у машинском инжењерству" COMET a (3 ; 2016 ;  
Источно Сарајево) Zbornik radova [Elektronski izvor] =  
Proceedings / 3. Међународна научна конференција  
"Primijenjene tehnologije u mašinskom inženjerstvu" COMETa  
2016, Istočno Sarajevo - Jahorina 2016 =3rd International  
Scientific Conference "Conference on Mechanical Engineering  
Technologies and Applications" COMETa 2016, East Sarajevo -  
Jahorina 2016. ; [urednici, editors Biljana Marković, Ranko  
Antunović]. - 1 izd. - Istočno Sarajevo : Mašinski fakultet, 2016. -  
1 optički disk (CD-ROM) : tekst ; 12 cm

Sistemske zahtevi nisu navedeni. - Radovi na srp. i engl. jeziku. -  
Napomene i bibliografske reference uz tekst. - Bibliografija uz  
svaki rad. - Rezimeji na engl. i srp. jeziku.

ISBN 978-99976-623-7-8

COBISS.RS-ID 6240280

ISBN 978-99976-623-7-8





## TEACHING-LEARNING-BASED OPTIMIZATION ALGORITHM FOR SOLVING MACHINE DESIGN CONSTRAINED OPTIMIZATION

Nenad Marjanovic<sup>1</sup>, Nenad Kostic<sup>2</sup>, Nenad Petrovic<sup>3</sup>, Mirko Blagojevic<sup>4</sup>,  
Milos Matejic<sup>5</sup>

*Abstract: The contemporary Teaching-learning based optimization method (TLBO), is used for solving machine design optimization problems. The method consists of two phases, teaching phase and learning phase. This method requires a small number of known facts which describe the problem in order to be able to find a solution. This research is oriented on software implementation of TLBO methods and problems in real world application for solving optimization problems. An original software has been developed which uses TLBO method. Testing the method is conducted on machine design examples from literature, and the results are compared to optimal solutions from literature. TLBO is a modern and very significant method, and this paper shows its convergence characteristics and practical implementation for engineering problems.*

*Key words: Constrained optimization, Machine design optimization, Optimization software, Teaching-learning-based optimization*

### 1 INTRODUCTION

Machine design presents a creative process with clearly defined goals with the simultaneous fulfilment of certain constraints and needs for adequate decision making. In order for this process to be successful, an optimal design solution, preferable for real application, must be made. Optimization is implemented with a clear definition of the objective function, optimization variables, existing constraints, feasible solutions and optimization method. Optimization is finding an adequate, possible solution from a group of alternative possible solutions. Heuristic methods are preferred for use in engineering problems due to their favorable characteristics, such as their ability to work with a large number of variables, overcoming local extremes, speed and efficiency of work, field of use, prerequisite knowledge of the problem being solved, etc.

There is a large number of heuristic methods such as Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Artificial Bee Colony (ABC), Ant Colony

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