

A Report

On

Two-day Workshop

Advanced Optimization Techniques and Research Directions

(16-17 September 2019)

Under

TEQIP-III

Course Organized by: -

Madhav Institute of Technology and Science,
Race Course Road, Gole ka Mandir,
Gwalior - 474005, Madhya Pradesh, India

1. Name of the Department/Section:

Department of Electrical Engineering

2. Name of the Activity:

Advanced Optimization Techniques and Research Directions

3. Date & Duration of activity:

16-17 September 2019

4. Expert of the Event: Prof. R. Venkata Rao, Department of Mechanical Engineering department **SVNIT, Surat**. **Dr. Rao** is a prominent researcher in the field of Optimization and proposed very popular Teaching Learning Based Optimization algorithm. Prof. R. Venkata Rao has completed his Ph.D. from B.I.T.S. Pilani, Rajasthan, India in 2002. And D.Sc. in 2016 from Politechnika Krakowska, Krakow, Poland. He has developed two advanced optimization algorithms named as “Teaching Learning-Based Optimization (TLBO) Algorithm” and “Jaya Algorithm” and these algorithms have gained wide acceptance and used by the research community in different disciplines of engineering. He has 300 plus research papers published in international journals and conference proceedings and received many national and international awards for his research efforts.

5. Details of activity in 150 words

In day 1, Prof Rao started the discussion with brief introduction on classical and advance optimization techniques. He talked about optimization technique & its benefits such as;

- The optimization technique is a powerful way to get the design parameters and operating conditions that you want.
- This would guide the experimental work and reduce the risk and cost of design and operation.
- Optimization refers to finding the values of decision variables, that correspond to and provide the maximum or minimum of one or more desired objectives.
- The reliability of optimal solutions depends on the formulation of objective functions and the selected optimization technique.
- Optimization requires a mathematical model that describes and predicts the process behaviour.
- In complex non-linear processes, optimization search could help to estimate unknown parameters.

- Optimization could be implemented as a tool to enable scale-up methodologies and designs of multiphase reactors and flow systems.

After than he explained the mathematical model of the PSO, TLBO and Jaya algorithms in detail. He mentioned that Sometimes, when we need to optimize a problem, generally we select a random optimization algorithm that contains some parameters to be fine-tuned so that it will help us in finding the global optimum value as soon as possible with less amount of work and time. However, the initial guess of parameters and operating point may cause the problem of local minima.

For example, in the PSO algorithm, we need inertial weight (W) and acceleration coefficients ($c1$ and $c2$) as our parameters. We need to take the inertial weight (W) to be between 0.4 to 0.9 for getting better results and if we take $c1 > c2$, then it facilitates the Global Optimum whereas $c1 < c2$ facilitates the Local Optimum. But the TLBO and Jaya algorithms do not require any algorithm-specific parameters like that of W , $c1$, $c2$ in PSO algorithm.

In day 2, Prof Rao provided a hands-on experience of TLBO and Jaya algorithms to the participants to solve optimization problems. Dr. Manjaree Pandit and Dr Laxmi Srivastava also shared their experiences to deal with the optimization techniques. Total 64 participants were there in the workshop.

6. Photos of the event:





Vishal

Princy

Srivastava
21.09.19

Dr. Laxmi Srivastava
Prof. and Head, EED