



**EARTHMOVING TECHNOLOGY,  
EQUIPMENT AND MANAGEMENT  
FOR CIVIL ENGINEERING,  
INFRASTRUCTURE AND  
ENVIRONMENT PROJECTS  
(ONLINE)**

**3 CPD POINTS**

**SAICE is an ECSA Approved CPD  
Service Provider**



**Presented By: Professor Zvi Borowitsh**

### **What is the challenge?**

**"Earthwork from rock drill and blast, excavate, earth load and haul. Spread and compact have ever since been the major cost items in any Civil Engineering, Infrastructure, and environmental projects.**

**This Earthwork Optimization Course is intended to provide updated technology and advanced tooling for enhancing Earthwork efficiency, reduce project cost.**

Advanced manual and computerized techniques, for the selection of the most efficient and most economical spread of equipment and general layout.

- Equipment Economics & Earthwork Cost Evaluation Analysis
- Planning and managing earthmoving projects

### **Who should attend?**

This course has been of high demand for many years now, is aimed at Civil Engineering Company and Project Managers, Engineers and Technicians at Technical and Managerial levels, who are involved in the various stages of earthmoving in Civil Engineering, site development, road and rail transportation - Planning, Execution and Project Management.

### **Course outline?**

#### **Course Structure**

This is an Online Synchronous 3 consecutive days course, generally 08:30 to 16:30 plus tutorial time as needed, for:

- Mining Machine and Earthmoving Simulation
- Optimizing Earthmoving Systems
- Machine and Earthmoving Cost Analysis.

Literature (downloaded) Earthmoving Equipment, Technology and Management (by Prof Z. Borowitsh, 242 p.),

Remote learning platform (MS Teams, Zoom Cloud) enables interaction among participants and lecturer, and case studies group discussions.

**Accreditation:**

The course has been accredited for 3CPD points with the Engineering Council of South Africa. Subject to minimum session attendance of 85%, and fulfilment of all assignments pass rate of 75% (see course program)

**Course contents and Program****Day 1**

Properties of soil which affect earthmoving. Basics of Geo-Mechanics

Power required for various stages of Earthmoving.

The usage and interpretation of earthmoving machines performance curves.

Earthmoving production calculations. Variables affecting cycle time and production. Machine and fleet availability by MTBF, MTTR.

Principles of Machinery Component design. Diesel engine curves, power-train components, hydraulic systems, tracks and undercarriage. Earthmoving tire selection and management

Rock breaking techniques. Drilling and blasting, hydraulic hammers applications, rock ripping, Use of seismography for selecting rock breaking methods.

Bulldozers application, types of blades and their economical application range. Production calculations, manual and computerized.

Top loading methods and equipment. Track and wheel type front end loaders (FEL), SAE ratings, Load-Haul-Dump application (by application software) . FEL variety of attachments for excavation and material handling

**Day 2**

Mass excavation and loading by Hydraulic Shovels, Hydraulic Excavators, Power shovels, Draglines

Trenching techniques in earth and rock.

Earth hauling equipment and its application range:

On and off highway Mining and Quarry trucks, Articulated Dump Trucks. (ADT)

Scraper Applications - Push Loaded and Self Loading. Performance and production rates.

Leveling and grading equipment for road buildup and maintenance, Land levelers and motor graders. Automatic blade control - conventional, GPS and Laser guided.

Matching fleets for mine optimization. Implementation of the queuing theory.

Computerized simulation programs by TALPC-C software for loading and hauling by class demonstration and students exercising on own laptops. (see above).

**Day 3**

Design of site roads for optimizing haulage. Road materials and cross section, geometric designs for hauling efficiency and safety. Haul road maintenance.

Principals of fleet and site management. Planning an efficient spread of earthmoving equipment. Job Scheduling and Planning

Advanced earthmoving techniques - remote monitoring of earthmoving equipment. Payload sensing devices for on-site monitoring of actual production. Time and motion study. Truck dispatch. GPS applications and software interpretation, Tires for earthmoving, applications and maintenance. TKPH concept. Remote tire condition monitoring  
Basics of equipment economics. Fleet owning and operation cost.  
Safety regulations, case studies and guidelines in earthmoving sites

**Notes:**

- 1) Course might slightly change as to delegates orientation.
- 2) \*Software provider, RPMGlobal will grant a trial of its leading simulation software that is available to download and use on delegates own computers

## Course Lecturer

Prof. Zvi Borowitsh, of the University of the Witwatersrand, Johannesburg and the Israel Institute of Technology, specializing in Earth and Rock Excavation, Loading and Haulage Optimization, who has extensive academic experience as well as in managing and consulting for large scale earthmoving projects. Courses have been given for years now at the Technion, Israel Institute of Technology, at the School of Mining Engineering, University of the Witwatersrand, Johannesburg, and at the South African Institute of Civil Engineers (SAICE)

## Register?

T: +27 (0) 11 805 5947  
F: +27 (0) 11 805 5971  
E: [cheryl-lee@saice.org.za](mailto:cheryl-lee@saice.org.za)  
W: [www.saice.org.za](http://www.saice.org.za)

In-house courses can be arranged on request but are subject to a minimum number of delegate.