

## Construction Equipment Management

<b>Code</b> CEM-806	<b>Credit Hours</b> 3-0
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### Course Description:

This course provides a comprehensive introduction to construction equipment, focusing on the selection and production estimating of machinery. Students will gain essential knowledge and skills to analyze multiple equipment options effectively. The curriculum covers the operations, control, maintenance, and outputs of batch mixing plants, as well as a broad overview of various equipment types. Additionally, the course delves into the engineering principles behind earth-moving operations, equipping students with the ability to make informed decisions regarding machinery in construction projects.

### Text Books:

1. Construction Equipment Operation and Maintenance by Y. Pakra and M. Tushnakov, 1971. Mir Publishers Moscow.
2. Builders' Plant and Equipment by G. Barber, 1973. Newnes-Butterworths London.
3. Vorster, M. C. (2013). *Construction equipment economics* (2nd ed.). Dearborn Trade Publishing.
4. Nunnally, S. W. (2000). *Construction methods and management* (5th ed.). Prentice-Hall.
5. Nichols, H. L., & Day, D. A. (2008). *Moving the earth: The workbook of excavation* (6th ed.). McGraw-Hill Education.
6. Schaufelberger, J. E., & Migliaccio, G. C. (2019). *Construction equipment management*. Routledge.

### Prerequisites:

Nil

### ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	25%
Term Project	10%
ESE	45%

## Teaching Plan

Week No.	Topics	Learning Outcome
1-2	Introduction	<p>Equipment Cost. General Information. Equipment Types. The Cost of Construction</p> <p>Equipment. Ownership Costs. Depreciation Accounting. Operating Costs. The Cost of Owning and Operating Construction Equipment. Economic Life of Construction Equipment. Equipment Replacement Calculations. Equipment- Intensive Operations and Risks. Equipment Planning and Estimating</p>
3-4	Engineering Fundamentals of Moving Earth.	<p>General Information. Material Properties. Payload. Haul Route. Rolling Resistance. The Effect of Grade on Required Tractive Effort. The Effect of Grade on Locating Haul Routes. Coefficient of Traction. Power Transmission. The effect of Altitude on the Performance of Internal Combustion Engines. The Combined Effect of Pressure and Temperature on the Performance of Internal Combustion Engines. Drawbar Pull. Power Output and Torque. Performance Charts.</p>
5-6	Earthwork Equipment	<p>Tractors and Related Equipment. Tractors. Tractor Uses. Type. Performance Characteristics of Tractors.</p> <p>Bulldozers. General Information. Blades. Bulldozer Production Estimating.</p> <p>Clearing Land. Land-Clearing Operations. Types of Equipment Used. Clearing Techniques. Land-Clearing Production Estimating. Land-Clearing Production Study.</p> <p>Ripping Rock. General Information. Determining the Rippability of Rock. Determining the Speed of the Sound Waves in Rock. Ripper Attachments. Economy of Ripping Rock. Estimating Ripping Production.</p> <p>Scrapers. General Information. Scraper Types. Scraper Operation. Scraper Performance Charts. Cycle Time for Scraper. Operating Efficiency and Production. Push Tractors Required. Increasing Scraper Production. Scraper Load-Growth Curve. Rolling Resistance and Scraper Production. Scraper Performance Calculation.</p>

7-8	Lifting Equipment	<p>Cranes. Major Crane Types. Crawler Cranes. Hydraulic Truck Cranes. Lattice- Boom Truck Cranes. Rough Terrain Truck Cranes. All Terrain Truck Cranes. Heavy Lift Cranes. Modified Cranes for Heavy Lift. Tower Cranes. Crane Booms. Lifting Capacities of Cranes. Rated Loads. Rated Loads for Hydraulic Cranes. Rated Loads for Tower Cranes. Working Ranges for Cranes.</p> <p>Draglines and Clamshells. Introduction. Draglines. General Information. Types of Draglines. The Size of a Dragline. Basic Parts and Operation of a Dragline. Output of Draglines. Optimum Depth of Cut. Effect of the Depth of Cut and Swing Angle on Dragline Output. Effect of Bucket Size and Boom Length on Dragline Production. Effect of Material Class on the Cast of Excavating.</p>
9	<b>MID TERM EXAM</b>	
10-13	Diggers and Excavators	<p>Clamshells. General Information. Clamshell Buckets. Production Rates for Clamshells. Effective Clamshell Operations.</p> <p>Hydraulic Excavators. Front Shovels. Size of a Font Shovel. Basic Parts and Operation of a Front Shovel. Selecting a Front Shovel. Shovel Production. The Effect of the Height of Cut on Shovel Production. The Effect of the Angle of Swing on Shovel Production. Production Efficiency Factor.</p> <p>Hoes. The Basic Parts and Operation of a Hoe. Bucket Rating for Hydraulic Hoes. Hoe Operating Efficiency and Production.</p> <p>Loaders. General Information. Types and Sizes. Bucket Ratings for Loaders. Operating Specifications. Production Rates for Wheel Loaders. Production Rates for Track Loaders.</p> <p>Trenching Machines. General Information. Wheel-Type Trenching Machines. Ladder-Type Trenching Machines. Selecting Suitable Equipment for Excavating Trenches. Production Rates for Trenching Machines.</p>
14-15	Transportation and Haulage	<p>Trucks and Hauling Equipment. Trucks. Rear-Dump Trucks. Bottom-Dump Trailers. Capacities of Trucks and Hauling Equipment. Effect of Truck Size. Calculating Truck Production. Control of Hauling Cost. Truck Performance Calculations.</p> <p>Geotechnical Materials, Compaction, and Stabilization. Compaction of Geotechnical Materials. Types of Compacting Equipment. Roller Production Estimating.</p>

		<p>Vibro-compaction Methods.</p> <p>Conveyors, Elevators and Hoists. General Information. The Economy of Transporting Materials with a Belt Conveyor. Conveyor Belts. Power Required for Driving a Belt Conveyor. Power Requirement Components. Power Required for Moving an Empty Belt. Power Required for Moving a Load Horizontally. Power Required for Moving a Load Up an Inclined Belt Conveyor. Power Required to Turn Pulleys. Conveyor Belt Take-Ups. Holdbacks. Feeders.</p>
16-17	Concrete and Asphalt works	<p>Concrete Plants and Equipment. Introduction. Proportioning Concrete Mixtures. Fresh Concrete. Handling and Batching Concrete Materials. Ready-Mixed Concrete. Moving and Placing Concrete. Consolidating Concrete. Finishing and Curing Concrete. Shot-creting. Fly ash. Placing Concrete in Cold Weather. Placing Concrete in Hot Weather. Scaffolding and Shuttering.</p> <p>Asphalt Mix Production and Placement. Introduction. Asphalt Paving Materials. Asphalt Plants. General Information. Batch Plants. Drum Mix Plants. Dust Collectors. Liquid Asphalt Storage and Heating. Storage Silos. Paving Equipment. Asphalt Distributors. Asphalt Pavers. Compaction Equipment</p>