CONSTRUCTION METHODS AND EQUIPMENT MANAGEMENT

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INTENDED AUDIENCE : Post graduate students of Construction Technology and Management Specialization, Undergraduate students of Civil Engineering , People working in Construction Industry

INDUSTRIES APPLICABLE TO : Larsen and Toubro, Caterpillar, Liebherr, Hyundai Construction Equipment India and other Construction Equipment Companies.

PREREQUISITES : Engineering would be minimum qualification to understand the basics related to this course.

COURSE OUTLINE :
The key element for successful execution of any project is planning, which also includes planning of equipment. Due to recent advancement in mechanization, different models of machines are available in the market for a particular job. Hence the task of selection of right machine for the right job is quite challenging for project planner. Therefore, understanding of machine capabilities is very important for optimal selection and utilization of equipment. This course provides comprehensive information on guidelines for selection of equipment, estimation of cost and productivity of various equipment and determination of optimum replacement time of equipment. Knowledge on estimation of cost of equipment is very important, as accurate information on equipment cost is needed for preparation of bids. Further, a deep insight into excavation, pile driving methods, cranes and concreting equipment is provided, the information on which is very much essential for people working in construction industry

ABOUT INSTRUCTOR :

Dr. G. Indu Siva Ranjani holds a PhD in Civil Engineering (Building Technology and Construction Management) from Indian Institute of Technology, Madras, India. Presently, she is working as an Assistant Professor at Indian Institute of Technology in Guwahati, India. She has handled courses at IITG related to both Construction Management and Construction materials. Some of the management-related courses handled by her, to be mentioned are Construction Methods and Equipment Management, Quality and Safety Management and Construction Technology and Management. Similarly, in the materials domain, she has handled courses on Construction Materials and Advanced Concrete Technology. Her major research interests are lightweight concrete, sustainable construction materials and energy-efficient structures. She has also proposed new materials for the production of foamed concrete. Her work has been published in peer reviewed journals and cited more than 1000 times in leading scientific journals throughout the world. She has Completed 5 PhDs and 21 MTechs.

COURSE PLAN :

Week 1: Module 1: Introduction to course and Planning Process of Equipment

Lecture 1: Planning process of equipment

– Factors affecting equipment selection, Planning equipment utilization, Equipment utilization chart.

Module 2: Cost of Owning and Operating Construction Equipment

Lecture 2: Estimation of Ownership cost (Average Annual Investment method)

– Elements of ownership cost, Depreciation accounting methods, Cost Estimation using Average Annual Investment method.

Week 2: Module 2: Cost of Owning and Operating Construction Equipment

Lecture 3: Estimation of Ownership cost (Time value method)

– Use of compounding factors in Equipment cost estimation based on time value method.

Lecture 4: Operating cost of Equipment

– Operating cost components, Illustrations on estimation of operating cost.

Lecture 5: Equipment cost estimation

– Caterpillar & Peurifoy method – Illustrations on use of Caterpillar method and Peurifoy method for estimation of total equipment cost.

Week 3: Module 3: Equipment Life and Replacement Analysis

Lecture 6: Equipment Life and Replacement Analysis (Part 1)

– Physical life, Profit life, Economic life, Illustrations on determination of economic life of equipment.

Lecture 7: Equipment Life and Replacement Analysis (Part 2)

– Equipment Replacement analysis- Intuitive method, Minimum cost method, Maximum profit method.

Lecture 8: Equipment Life and Replacement Analysis (Part 3)

– Determination of economic life based on equivalent annual cost (using time value concept).

Week 4: Module 4: Engineering Fundamentals of Moving Earth

Lecture 9: Engineering Fundamentals of Moving Earth

– Machine Performance-Required power, Available power, Usable power, Rolling resistance, tractive force, co-efficient of traction, Effect of grade on tractive effort, Effect of altitude on performance of IC engines, Performance chart, ways to define payload of equipment.

Module 5: Earthmoving and Excavating equipment

Lecture 10: Bull Dozers

– Bull Dozers-Types of dozer blades, blade adjustments, Blade performance, production estimation.

Lecture 11: Scrapers (Part 1)

– Scrapers, Scraper operation, types of scraper, Components of production cycle of scraper and pusher.

Lecture 12: Scrapers (Part 2)

– Illustrations on production estimation of scraper and balancing interdependent machines.

Week 5: Module 5: Earthmoving and Excavating equipment

Lecture 13: Front End loaders

– Front-End loaders –loader attachments, productivity estimation.

Lecture 14: Excavators

– Excavators-Front shovels and backhoes, operation, factors affecting selection, production estimation.

Lecture 15: Trucks

– Production cycle, cycle time estimation, Productivity of trucks, balancing interdependent machines.

Week 6: Module 6: Piles and Pile driving equipment

Lecture 16: Piles and Pile driving equipment (Part 1)

– Pile types: Precast and cast in situ piles, pile hammers, principle of pile hammer, factors affecting pile hammer selection.

Lecture 17: Piles and Pile driving equipment (Part 2)

– Types of pile hammer: Drop hammer, Single acting and double acting steam hammers, Diesel hammers, Vibratory pile drivers.

Week 7: Module 7: Lifting equipment

Lecture 18: Cranes (Part 1)

– Cranes, Crane motions, Principles of lifting mechanism of crane, types of cranes-lattice boom crawler crane, lattice boom truck mounted cranes, telescopic boom crane.

Lecture 19: Cranes (Part 2)

– Types of cranes-Tower cranes, Factors affecting lifting capacity of crane, Range diagram.

Week 8: Module 8: Concreting equipment

Lecture 20: Concreting equipment (Part 1)

– Steps in concrete making process, types of concrete mixer machines.

Lecture 21: Concreting equipment (Part 2) & Conclusion

– Methods of handling and transporting concrete, Consolidation of concrete, Methods of finishing and curing of concrete.