TABLE OF CONTENTS

PREFACE.	3
TABLE OF CONTENTS	
SUBJECT SYLLABI	
I) Contents of Lectures.	
II. Subject Objectives	
III. Subject Description	
INTRODUCTION	
I. GENERAL CONSIDERATIONS ON LAND RECLAMING TECHNIQUES	13
1.1 Land Reclaiming Measures	
1.1.1 Agricultural-forest Improvement Techniques	
1.1.2 Land Reclaiming Measures of Technical Character	
1.2 Soil Deterioration	15
1.2.1 Types of Soil Deterioration	15
1.2.2 Soil Erosion	
1.2.2 Soil Anti-erosion Measures	16
1.3 Regional Causes of Soil Deterioration	
1.4 Local Causes of Soil Deterioration	18
1.5 Evaluation of Economic Efficiency of Investments	
1.5.1 Character of Land Reclaiming Interventions	
1.5.2 Economic Efficiency of Investment Costs	
1.5.3 Efficiency of Land Reclaiming Interventions	
1.5.4 Producer's and Society's Net Income	20
1.5.5 Profitability Indicator and Index of Profitability	
1.5.6 Pay-off Period	
1.5.7 Analytical and Technical Indicators	
1.5.8 Strategy for Implementation of a Land Reclaiming Intervention	
II. PHYSICO-MECHANICAL PROPERTIES OF EARTH AND THEIR EFFECTS ON LAND R.	
MACHINES AND EQUIPMENT	
2.1. Earth and Soil.	
2.1.1 Soil Development Process	
2.1.2 Classification of Earths	
2.2 Structure of Earths.	
2.2.1 Importance of Earth Structure	
2.2.2 Importance of Shape and Size of Earth Granules	
2.2.3 Different Sorts of Earths	28
2.3 Cohesion of Earths	
2.4 Adhesion of Earths	
2.5 Consistency and Shrinkage of Earths	
2.5.1. Earth Consistency	
2.5.2 Earth Shrinkage	31
2.5.3 Earth Workability and Disreputability	31
2.6 Earth Permeability	
2.6.1 Porosity	32
2.6.1 Porosity Number	33
2.7 Water in Earth	34
2.7.1 Earth Free Water	34
2.7.2 Hydroscopic Water	35
2.7.3 Wrapping Water	
2.8 Humidity of Earth	
2.9 Pressures and Deformations in Earth	
2.9.1 Pressure Deformations of the Earth	
2.9.2 Sliding deformations in the Earth	
2.10 Internal Friction in Earths	
2.11 Resistance against Sliding	
2.12 Angle of Natural Slope	41
2.12.1 Angle of Natural Slope – Case of Incoherent Earths	41
2.12.2 Angle of Natural Slope - Case of Coherent Earths	42

2.12.3 Angle of Natural Slope – Case of Coherent Earths under Influence of Groundwater	43
2.13 Compacting and Stabilization of Slopes	45
2.13.1 Stabilization in Two Phases	45
2.13.2 Temporary Stabilization	45
2.13.3 Permanent Stabilization	47
2.14 Earthmoving Specifications	48
2.14.1 Clearing and Grubbing	48
2.14.2 Stripping	48
2.14.3 Replacing of Unsuitable Material	
2.15 Basic Earthmoving Operations.	
2.15.1 Digging	
2.15.2 Moving the Material	
2.15.3 Dumping Material	
2.15.4 Final Construction Steps	
2.15.5 Summary of Earthmoving Operation technology	49
2.15.6 Types of Earthwork Equipment	
2.15.7 Earthmoving Work Cycle	
2.16 Nature of Earthwork Material	
2.16.1 Swell and Shrinkage.	
2.16.2 Load Factor	
2.16.3 Shrinkage Factor	
2.17 Forces Governing Motion of Equipment	55
2.17.1 Rolling Resistance	
2.17.2 Grade Resistance and Grade Assistance	.56
2.17.3 Total Resistance and Effective Grade	57
2.17.4 Tractive Effort	
2.17.5 Traction	
2.17.6 Other Resistance to Moving Equipment	
2.18 Power	
2.18.1 Rimpull	
2.18.2 Drawbar Pull	
2.19 Minimizing Power Requirements	
2.19.1 Essence of Power Output	
2.19.2 Two Alternatives of Power Requirements	.62
2.19.3 Principles to Minimize Power Requirements	
II. PLANNING AND DESIGN OF IRRIGATION/DRAINAGE SYSTEMS IN RELATION TO MECHANIZA	TION
3.1 Food Production: the Critical Role of Water.	
3.1.1 Importance of the Water	
3.1.2 Irrigated Agriculture	63
3.1.3 Water Supply	
3.1.4 New Water Supplies.	
3.1.5 Water Use Efficiency	
3.1.6 Irrigation Economy	
3.1.7 Water Policy	
3.2 Increased Food Production and Investments in Irrigation and Drainage Projects	
3.2.1 Action Plan for Agriculture	
3.2.2 Consequences of Inefficient Irrigation and Drainage Systems	70
3.2.3 Causes of Inefficient Irrigation and Drainage Systems - Planning for Improved Systems	70
3.2.4 Efficient Irrigation and Intensive Cropping and Farm Mechanization.	
3.2.5 Efficient Irrigation and Advanced Planning Techniques and Appropriate Technology	
3.3 The Role of Mechanical and Labour Intensive Methods for Construction	
3.3.1 Agricultural Development Including New Irrigation Facilities Increases Employment Opportunities	73
3.3.2 Earthmoving and Scope for Labour-Intensive Methods	7/
3.3.3 Scope for Animal Powered Implements	
3.3.4 Selection and Use of Mechanical Powered Equipment for Construction.	
3.3.5 Design and Use Characteristics of Construction Machinery	76
3.3.7 Laser Controlled Machinery	76
3.4 Relationships between Farm Mechanization, Irrigation and Cropping Systems.	
3.4 Kelanonsimps between Parin Mechanization, Imganon and Cropping Systems	//

3.4.1 Water Application and Availability	
3.4.2 On-Farm Water Management	
3.4.3 Problems of Mechanization	
3.4.4 Land Preparation Practices	
3.4.5 Planting Patterns and Practices.	80
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTERS I. – III.	
IV. CHOOSING CONSTRUCTION EQUIPMENT	
4.1 Introduction	
4.2 Classification of Construction Equipment	
4.2.1 Functional Classification of Equipment	
4.2.2 Operational Classification of Equipment	
4.3 CONSTRUCTION OPERATIONS	
4.3.1 Removal of Existing Material	
4.3.2 Transporting Material	
4.3.3 Processing Material	
4.3.4 Moving Processed Materials	
4.3.5 Placing Finished Material.	
4.4 Equipment Selection Factors.	
4.4.1 Specific Construction Operation	
4.4.2 Specification Requirements	
4.4.3 Conditions at the Job Site	
4.4.4 Location of the Job Site	
4.4.5 Project Time Schedule	
4.4.6 Balancing of Interdependent Equipment	
4.4.7 Mobility Required of the Equipment	90
4.4.8 Versatility and Adaptability of the Equipment	
4.5 Equipment Economics	
4.5.1 Time Value of Money	
4.5.2 Equipment Ownership Costs	
4.5.2.3 Equipment Operating Costs	
4.5.3 Buying, Leasing, and Renting Equipment	
4.5.4 Economic Life of Equipment	
4.5.4 Cost Accounting and Control	111
4.5.5 Maintenance of Construction Equipment	
4.5.5 Computer Applications	
4.5.6 Statistical Analysis of Data	
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER IV.	
V. DOZERS AND RIPPERS	
5.1 Introduction	
5.2 Dozer Specifications and Attachments	
5.2.1 Components of Crawler Tractors	
5.2.2 Components of Wheel Tractors	
5.2.3 Bulldozer Blades and Similar Attachments	
5.2.4 Rippers	
5.2.5 Pushblocks	
5.3 Bulldozing and Ripping Operations	
5.3.1 Bulldozer Operations	
5.2.2 Ripper Operations	
5.3 Productivity of Dozers	
5.3.1 Bulldozing	
5.3.2 Ripping	
5.3.3 Pushloading	
5.4 Costs of Tractors	
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER V	
VI. GRADERS AND SCRAPERS	
6.1 Motor Graders	137
6.1.1 Motor Grader Specifications	137
6.1.2 Motor Grader Applications	139
6.1.3 Motor Grader Productivity	
6.1.4 Motor Grader Costs	142

6.2 Scrapers	142
6.2.1 Scraper Specifications	143
6.2.2 Scraper Applications	
6.2.3 Scraper Productivity	148
6.2.4 Scrapers Costs	155
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER VI.	156
VII. LOADERS AND HAULERS	158
7.1 Loaders	158
7.1.1 Front-End Loader Specifications	158
7.1.2 Front-End Loader Applications	164
7.1.3 Productivity of a Front-End Loader	164
7.1.4 Costs for Front-End Loaders	168
7.2 Hauling Equipment	168
7.2.1 Hauler Specifications	169
7.2.2 Use and Productivity of Haulers	173
7.2.3 Costs of Hauling Equipment	179
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER VII	181
VIII. COMPACTORS	
8.1 Compactors Specifications	182
8.2 Compaction Equipment	
8.3 Compactor Applications	
8.4 Compactor Costs	
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER VIII	
IX. EXCAVATORS	
9.1 Undercarriages	
9.1.1 Crawler Undercarriages	
9.1.2 Wheel Undercarriages	
9.1.3 Walking Undercarriages	
9.2 Excavators Specifications	
9.2.1 Power Excavator	
9.2.2 Trenchers	
9.2.3 Applications of Shovels	
9.2.4 Draglines	
9.2.5 Features of a Dragfine Excavators. 9.3 Productivity of Excavators.	
9.4 Costs of Shovel and Dragline Excavators	
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER IX.	
X. CRANES AND HOISTING EQUIPMENT	
10.1 Erection Operation and Equipment	
10.1 Election Operation and Equipment.	
10.2.1 Forklift Specifications.	
10.2.2 High Lift Specifications	
10.2.3 Straddle Truck Carriers	
10.3 Wire Rope and Rigging.	
10.4 Portable Truck-Mounted Booms	
10.5 Mobile Cranes	
10.5.1 Cranes for Erection Operations	
10.5.1 Cranes for Election Operations	220
10.5.3 Lifting Capacities of Mobile Cranes	
10.5.4 Applications of Mobile Cranes	227
10.5.5 Costs of Mobile Cranes	227
10.6 Derricks	
10.7 Tower Cranes	
10.7.1 Tower Crane Design.	
10.7.2 Tower Crane Load Capacities and Operations	
10.7.3 Tower Crane Power and Costs	
10.8 Gantry Cranes	
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER X.	
APPLICABLE EQUIPMENT STANDARDS TO THE CHAPTER X	
XI. AGGREGATE PRODUCTION EQUIPMENT	

11.1 Crushers for Aggregate Production	236
11.1.1 Principles of Rock Crushing	238
11.1.2 Design Features of Crushers.	239
11.1.3 Capacities and Selection of Crushers	243
11.2 Feeders and Related Plant Components	246
11.3 Screening and Screens	247
11.3.1 Design Features of Screens	247
11.3.2 Screen Capacities	249
11.4 Aggregate Production Plant Design	252
11.4.1 Flow Diagrams for the Aggregate Process	
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER XI.	252
XII. CONCRETE PLANTS	254
12.1 MATERIALS HANDLING EQUIPMENT	254
12.1.1 Handling Aggregates	255
12.1.2 Handling Cement	256
12.2 Concrete Batching and Mixing	
12.2.1 Batchers and Control Equipment	257
12.2.2 Mixers	261
12.2.3 Central Mixing Plants	266
12.3 Concrete Hauling and Placing Equipment	266
12.3.1 Concrete Hauling Equipment	267
12.3.2 Equipment for Placing Concrete	
BIBLIOGRAPHY AND REFERENCES TO THE CHAPTER XII	272
VOCABULARY	274