

ECON7007	Infrastructure Economics	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Graduate in Engineering/Science discipline				
Co-requisites	Basic understanding about Infrastructure sector				

Course Objectives

1. To provide students with a thorough grounding in the key concepts of Infrastructure economics.
2. To illustrate how these concepts and standard economic tools can be used to analyse Infrastructure-related Theory and policy issues.
3. To be able to apply this knowledge to the analysis of specific infrastructure economics issues in India

Course Outcomes

On completion of this course, the students will be able to exhibit.

- CO1.** Students will be exposed to the concepts and models related to Infrastructure.
- CO2.** Students will understand basic Economics theories and models required for infrastructure sector understanding.
- CO3.** Students will be able to demonstrate clear understanding of concepts Infrastructure economics and policy
- CO4.** Students will exhibit the ability to integrate technical, economic, social and regulatory frameworks for Infrastructure sector planning and resource management.

Catalog Description

This course studies the economic aspects of infrastructures using the tools of economic analysis in deciding the optimal level of infrastructure provision, the role of public and private sector in their provision and operation and shows the policy implications of the deregulation process that has taken place in infrastructure markets in recent years. The emphasis of the course is empirical, with detailed examples and case studies to show the economic consequences of alternative policy designs

Course Content

Unit I: 7.0 lecture hours

Introduction to Economics & Infrastructure sector, Application of Economics to Business Decisions: An Example, Objective, Nature & Importance of Infrastructure Economics, Theory of demand and supply, Elasticity of Demand, Price Elasticity of Demand, Income Elasticity of Demand, Cross Elasticity of Demand, Promotional Elasticity of Demand., Elasticity of Supply & its Kinds, Demand Forecasting: Need, steps of process, Demand forecasting techniques, Survey methods, Statistical Methods, Input-Output forecasting

Unit II: 6.0 lecture hours

Some basic concepts of production, Production functions, Short- run Law of production: Production with one variable production factor, Long- Run Law of Production: Production with two variable production factors, The Relationship between Production and Cost, Short-run Cost Behavior: Key Relationships: Average Total Cost, Average Fixed Cost, Average Variable Cost, and Marginal Cost, Long-run Cost Behavior, Concepts of revenue: Total, Average and Marginal Revenue, Relationship between AR, MR & TR, Profit maximization & Minimization conditions, Objective of Firm, Profit Analysis with special reference to Break Even Analysis of infrastructure sector

Unit III: 7.0 lecture hours

Theory of Production: Production Function; Laws of Production — Law of Variable Proportions; Law of Returns to Scale. Production with Two Variable Inputs — Isoquants: Slopes and Properties, Isoquant Map, Iso-cost Lines, Producer's Equilibrium; Expansion Path, Ridge Lines, Cobb-Douglas and CES production function, Decision-making on infrastructure provision (Cost Benefit Analysis and beyond)

Unit IV: 10.0 lecture hours

Market Structure: Market: Definition; Concepts of Product and Factor Markets; Features and the Shapes of the Demand (or Average Revenue) Curve under Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly Market Structures; Concepts of Firm and Industry; Equilibrium of the Firm

Theory of Product Pricing; Equilibrium of the Firm under Perfect Competition; Monopoly; Monopoly Power: Sources and Measurement; Price Discrimination in infrastructure sector: Concept and Conditions; Typology — First, Second and Third Degree Price Discrimination in infrastructure sector, Monopolistic Competition: Product Differentiation, Advertising, Price-output Determination; Excess Capacity, Equilibrium in an Oligopolistic Market; Nash Equilibrium; the Cournot Model; Price Rigidity; Price Leadership in Infrastructure sector .

Unit V: 6.0 lecture hours

Introduction to Infrastructure sector, Infrastructure industry as Public Utility, Rate Level Determination and Rate Structure Determination, Pricing in infrastructure industry and some issues in pricing, Regulatory Economics: Introduction –I, Regulatory Economics: Introduction-II, Determining Regulatory Asset Base-I, Determining Regulatory Asset Base-II, The Experience of Economic Regulation, The Experience of Economic Regulation, Life Cycle Cost Model

Text Books

1. Koutsoyiannis, A: Modern Microeconomics
2. Prasad, A.R: Working Tools of Microeconomics
3. Jain, T.R: Microeconomics and Basic Mathematics
4. Henderson, J. and R.E. Quandt: Microeconomic Theory – A Mathematical Approach.
5. Baumol, W.J. (1982): Economic Theory and Operations Analysis
6. Lipsey, R.G. and K.A. Chrystal: Principles of Economics.
7. Kreps, D. (1990): A Course in Microeconomic Theory. Princeton, N.J.: Princeton University Press
8. Stonier, A.W. and D.C. Hague (1972): A Textbook of Economic Theory, ELBS & Longman Group, London.
9. Hal R. Varian (1993): Intermediate Microeconomics, a Modern Approach, Affiliated East West Press
10. Ray, N.C: An Introduction to Microeconomics.
11. Mehta, Prem L. et al. (2005): Microeconomics, Pearson Education, Delhi

Reference Books

1. Crew. M.A & P.R. Kleindorfer: Public Utility Economics, Macmillan, London.
2. ICSSR (1976): Economics of Infrastructure, Vol. VI, New Delhi.
3. Parikh, K.S. (Ed.): India Development Report-1999-2000, Oxford, New Delhi.
4. Turvey, R. (Ed) Public Enterprise, penguin, Harmonds Worth.
5. Welson, J.R.: Marginal Cost Pricing in Practice, Prentic Hall.
6. Kneafsey, J.T.: Transportation Economic Analysis, Lexington, Toronts.
7. Farirs, M.T. & R. Sampson: Public Utility, Houghton Miffin, Boston
8. Goyal, S.K. :Public Interprises,Indian institute of Public administration, new Delhi

Modes of Evaluation

Quiz/Assignment/Presentation/Extempore/ Written Exam

Examination Scheme

Components	Internal Assessment (Quiz/Assignment/Presentation/Extempore)	End-Semester Exam (Written Exam)
Weightage (%)	50%	50%

Program Outcomes

- PO1. Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions.
- PO2. Students will demonstrate effective application capabilities of their conceptual understanding to infrastructure planning, development and management.
- PO3. Students will be able to exhibit effective decision-making skills, employing analytical and critical thinking ability for planning, development and management of soft and hard infrastructure.
- PO4. Students will demonstrate effective oral and written communication skills in the professional context.
- PO5. Students will be able to work effectively in teams and demonstrate team-working capabilities.
- PO6. Students will exhibit leadership and networking skills.
- PO7. Students will demonstrate sensitivity towards ethical and moral issues and have ability to address them in the context of urban planning, development and management including cost effective financing and good governance.
- PO8. Students will demonstrate employability traits in line with the needs of changing hard and soft urban infrastructure sector.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes	Mapped Programme Outcomes
CO1	Students will be exposed to the concepts and models related to Infrastructure Economics	PO1
CO2	Students will understand basic Economics theories required for infrastructure sector understanding	PO2
CO3	Students will be able to demonstrate clear understanding of concepts Infrastructure economics and Policy	PO3
CO4	Students will exhibit the ability to integrate technical, economic, social and regulatory frameworks for Infrastructure sector planning and resource management.	PO4, PO6, PO8

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
ECON7007	Infrastructure Economics	3	3	3	1		2		3

1=weakly mapped

2= moderately mapped

3=strongly mapped

Master's-Level Programs

In master's-level programs, knowledge of the key content areas and functional disciplines of business is assumed. Graduates of master's-level programs should acquire a depth of knowledge in these areas that exceeds that of the typical bachelor's degree graduate.

Graduates of master's-level programs in business should be able to:

1. Recognize problems
2. Integrate theory and practice for the purpose of strategic analysis
3. Employ and apply quantitative techniques and methods in the analysis of real-world business situations
4. Communicate to relevant audiences; graduates should be able to:
 - a). Compose clear, consistent, and effective written forms of communication
 - b). Compose and present effective oral business presentations
5. Work effectively with a team of colleagues on diverse projects
6. Identify and analyze the ethical obligations and responsibilities of business

Model Question Paper

Name:			
Enrolment No:			
Course: ECON7007– Infrastructure Economics			
Programme: MBA Urban Infrastructure & Smart Cities		Semester: ODD	
Time: 03 hrs.		Max. Marks: 100	
Section A (Answer all questions) (2 Marks * 10 = 20 Marks)			
1. Select whether True and false .All the questions in this section carry 2 marks each,			
A.	The assets involved in infrastructure industry have high initial cost.	[2]	CO1
B.	Infrastructure industry means the industry which plays direct role in the production process.	[2]	CO1

C.	According to projections by government bodies Port sector will have maximum private partnership.	[2]	CO1
D.	All industries rendering essential services called natural monopoly.	[2]	CO3
E.	As level of output increases, contribution of average fixed cost decreases and average variable cost increases in average cost.	[2]	CO3
F.	Price discrimination help in partial utilization of facilities.	[2]	CO2,
G.	MC pricing does not help to recover total cost.	[2]	CO1
H.	Privatization process in infrastructure was introduced to increase government subsidy.	[2]	CO3
I.	In Life Cycle Cost model, O&M phase has maximum time.	[2]	CO2
J.	The cost incurred in R&D phase is sunk cost.	[2]	CO4
2	Section B (Answer any four questions) (5 Marks * 4 = 20 Marks) All the questions in this section carry 5 marks each,		
A	If demand function and supply functions are $Q = \alpha - \beta P$, $Q = \gamma + \delta P$, what is equilibrium price and quantity? Also represent this with the help of diagram.	[5]	CO1
B	If capital and labour are perfect substitutes in a production, then explain the shape of the production function and its implication.	[5]	CO2,
C	Explain about the different infrastructure committee which promote private partnership	[5]	CO2,
D	Explain the features & objective of Public-Private Partnership Appraisal Committee (PPPAC).	[5]	CO2
E	Explain about Viability Gap Funding (VGF).		CO2, CO3
	Section C (Answer any three questions) (10 Marks *3 = 30 Marks)		
A	Explain Meaning, Characteristics & objective of Public Utility.	[10]	CO3, CO2, CO3, CO4
B	Explain about meaning & method for Rate level determination & measurement of Depreciation in public utilities.	[10]	CO1, CO2
C	Discuss Life Cycle Cost model & its significance in infrastructure industry.	[10]	CO1, CO2
D	Infrastructure industry is considered as a natural monopoly". Discuss the factors which make an industry natural monopoly and how government has treated these factors for privatization purposes	[10]	CO1, CO2

Section D			
(Answer any one question) (30 Marks *1 = 30 Marks)			
A	<p style="text-align: center;">Read the following case let and answer the questions. This section carries 30 marks.</p> <p style="text-align: center;"><u>Konkan Railway Corporation Ltd.</u></p> <p>KRCL is the first venture SPV formed in public- Public partnership in 1990 between four state governments, for constructing a new 760 km coastal railway line to cut short the distances from Mumbai to Goa, costal Karnataka and Kerala. The partnership was formed because IR didn't have the funds whereas the state governments were ready to pay. The SPV was given a BOT concession by the Ministry of Railway for 10 years. The Rs 14 billion projects was proposed to be financed through a 2.5:1 debt equity ratio with 51% equity from MOR and the balanced share among the four state governments. Debt was entirely through market bonds guaranteed by the Government of India (GOI). The project structuring was based on conventional government contracting with the major construction risk borne by the company. There was uncertainty about the piecemeal debt raising, and interest risk was entirely borne by the company. The state governments did not bear any risk as their role was limited to extending their share of the equity fund. The project was appraised with a significant transfer of tariff from the parallel existing network; however there was no written guarantee for this transfer. The railway Board did the regulation of tariff and tariff, largely favoring the zonal railway as subsequent gauge conversion had added capacity to the existing parallel network. The completed cost of the project was Rs 33.75 billion, with Rs 8 billion in equity and the rest in debt. This is also the only organization outside IR which owns, operates, and maintains its assets, as does any zonal railway. KRCL is considered a major technological and operating success that developed cutting edge construction expertise (now being used in other projects including the Jammu and Kashmir Railway Projects) and modern operations and maintenance (O&M) systems establishing new benchmarks for operating efficiency. It also carried out several engineering innovations. However it had accumulated losses of Rs. 23.53 billion till year 2003-04. Ti is in a debt trap and with the balance sheet in red it cannot bid for International projects in spite of having the construction expertise.</p> <p>KRCL's engineering and operating success shows that the creation of a project specific company enables better project management, and establishes new benchmarks for IR in terms of efficiency of operations. However it also shows that short-term debt and high debt-equity ratio are not suitable for railway projects. Without non-recourse financing and independent due diligence by the lending financial institutions it is difficult to ensure realistic traffic forecasting and sound financial appraisal. A regulatory mechanism is needed for paying a neutral role when the interest of a zonal railway and an SPV clash. Government guaranteed debt blocks subsequent financial restricting of the company.</p> <p>BOT (SPV): The BOT model in which a concession is given to a special purpose vehicle (SPV) such as KRCL or PRCL is different from the BOT model in two respects: it does not involve any competitive bidding and there is a majority or equal partnership</p>	[30]	CO3, CO2 CO1

	<p>of the IR in the project company resulting in a lower degree of privatization than the BOT model. Hence, it is treated separately under the category of BOT (SPV), to distinguish it from the BOT concession given to a private entity. This model is suited for two types of railway projects.</p> <ul style="list-style-type: none"> • Projects for which strategic private investors can be found and which are financially viable without any grant or subsidy from the government, and whose project development could be done either by the railways or by the private sector. Port linking projects, private siding for a manufacturing unit (steel factories, refineries etc.) and link lines to mines fall under this category. These are attractive for the private investors whose strategic interest such projects serve. • Projects which are essentially required by the government for its long term capacity augmentation but where the government does not have the funds to finance it alone; for which private partners can be found from the beginning which are not financially viable enough to be financed by the market and whose development has to be done by the IR. Suburban rail projects, dedicated rail corridor projects etc. fall into this category. These projects could be started without any private partnership in the SPV, with the private sector being roped in once the project line becomes operational and starts offering a return. <p>Evaluate the case let on the basis of following criteria: (5+3+5+5+5+3+4 marks)</p> <ol style="list-style-type: none"> 1. Type of project 2. Need for PPP 3. Nature of Funding 4. Risk Management 5. Regulatory Mechanism 6. Success/failures 7. Lessons learnt 		
B	<p>What are Price discrimination and its degrees and its significance in decision making?</p> <p style="text-align: right;">(30 Marks)</p>	[30]	CO2, CO3, CO4