Faculty of Science and Technology
Savitribai Phule Pune University
Maharashtra, India

http://unipune.ac.in

Honors* in Metro Construction

Board of Studies
(Civil Engineering)
(with effect from A.Y. 2021-22)

Dear Students

It gives me an immense pleasure to introduce a state-of-the-art course on Metro-construction as an Honors Program under Civil Engineering Curriculum starting from June 2021. The honors courses will start from TE civil and will continue in BE as well. Students are referred to

http://collegecirculars.unipune.ac.in/sites/documents/Syllabus2020/Rules%20and%20Regulations%20of%20Honors%20and%20Minors_17.02.2021.pdf

for details about the honors program.

Metro rail system is about to become a major transportation medium in India in Metro cities and two-tire cities as well. The Metro having different names as Tube, Subway, Metro, Ubahn, Sbahn is already a popular means of transportation in all the major cities of the world. It's a high time that we at the University level should include this as a part of our curriculum. We the Board of Civil of Engineering are introducing the honors course on Metro-construction from June 2021 starting at TE. In our opinion it would give another opening to students pursuing their BE (Civil) under the aegis of Savitribai Phule University. I thank all the faculty members involved in framing the syllabus of this honors program. I would like to thank all the Board of Studies members for unanimously approving this honors program. Finally I would like to thank the faculty of Science and Technology, Dean faculty of Science and Technology, Hon. members of the academic council and Hon. Vice Chancellor for giving the necessary approval to start this program.

Prof. Shreenivas Londhe
Chairman BOS (Civil Engineering)
SPPU Pune

Savitribai Phule Pune University
With effect from 2021-22

Honors* in Metro Construction

Year & Semester	Course Code	Course Title	Teaching scheme Hours/week			Examination Scheme and Marks						Credit Scheme		
			Theory	Tutorial	Practical	Mid-Semester	End-Semester	Term work	Practical	Presentation	Total Marks	Theory / Tutorial	Practical	Total Credit
T E & V	301301	Surveying in Metro construction	4	--	--	30	70	--	--	--	100	04	--	04
	301302	Surveying in Metro construction -Lab	--	--	02	--	--	50	--	--	50	--	01	01
		Total	4	--	02	100		50	-	-	150	04	01	05
										Total Credits =		**05**		
TE &VI	301303	Planning and Quantity estimation for metro construction	4	--	--	30	70	--	--	--	100	04	--	04
		Total	4	--	--	100		--	--	--	100	04	--	04
										Total Credits =		**04**		
BE & VII	401301	Work Method Statement Making	4	--	--	30	70	--	--	--	100	04	--	04
	401302	Work Method Statement Making-Lab	--	--	02	--	--	50	--	--	50	--	01	01
		Total	4	--	02	100		50	--	--	150	04	01	05
										Total Credits =		**05**		
BE & VIII	401303	Tunnel Engineering	4	--	--	30	70	--	--	--	100	04	--	04
	401304	Seminar	--	2	--	--	--	--	--	50	50	02	--	02
		Total	4	2	--	100		--	--	50	150	06	-	06
										Total Credits =		**06**		

Total Credit for Semester V+VI+VII+VIII = 20

*** To be offered as Honours for Major Disciplines as–**

1. Civil Engineering

For any other Major Disciplines which is not mentioned above, it may be offered as Minor Degree.

SEMESTER V

Savitribai Phule Pune University, Pune
TE Civil (2019 Pattern) w. e. f. June 2021
Honors in* Metro Construction
301301: Surveying in Metro construction

Teaching scheme	**Credit**	**Examination scheme**
Lectures: 04 Hours/week	04	In semester exam: 30 Marks End semester exam: 70 Marks

Course Contents

Unit I: History and General Features of Indian Metro Railway (08 Hours)

Developments in Indian Metro Railway in India. The first rapid transits system in India was Kolkata Metro. Kolkata Metro, Delhi Metro, Bengaluru Metro, Mumbai Metro, Jaipur Metro

Unit II: Developments in Indian Metro (08 Hours)

Developments in Indian Metro Railways, Different Modes of Transport, Organization of Indian Metro Railways, Indian Metro Railway Finances and their Control, Commission of Metro Railway Safety, Long-term Corporate Plan of Indian Metro Railways, General Features of Indian Metro Railways, Important Statistics of Indian Metro Railways.

Unit III: Alignment of Metro Railway Lines (08 Hours)

Importance of Good Alignment, Basic Requirements of an Ideal Alignment, Selection of a Good Alignment. Engineering Surveys and Construction of Metro Railway Need for Construction of a New Metro Railway Lines, Preliminary Investigations for a Metro Railway, Traffic Survey, Reconnaissance Survey, Preliminary Survey, Preliminary Engineering-cum-traffic Survey, Final Location Survey, Modern Surveying Techniques for Difficult Terrain, Construction of New Lines of Metro Railway

Unit IV: Track and Track Stresses (08 Hours)

Requirements of a Good Track, Maintenance of Permanent Way, Track as an Elastic Structure, Forces Acting on the Track Tunnel Railways

Unit V: Requirements for Metro -Station (08 Hours)

Metro Railway Stations and Yards, Purpose of a Metro Railway Station, Selection of Site for a Metro Railway Station, Facilities Required at Metro Railway Stations, Requirements of a Passenger Metro Railway Yard, Classification of Metro Railway Stations, Station Platforms, Main Building Areas for different Types of Metro Stations.

Unit VI: Construction of New Metro Railway Lines and Track Linking of Metro Railway Tunnelling (08 Hours)

Necessity/Advantages of a Tunnel, Tunnel Alignment and Gradient, Size and Shape of a Tunnel, Methods of Tunnelling, Ventilation of Tunnels, Lighting of Tunnels, Drainage of Tunnels , Shaft of Tunnels , Lining of Tunnels , Maintenance of Railway Tunnels, Safety in Tunnel Construction.

Text Books

01 Metro Rail Projects in India: A Study in Project Planning Book by M. Ramachandran

02 Urban rail transit construction technology demonstration project: Guangzhou Metro Line Paperback – January 1, 2000 by LU GUANG LIN. CHEN SHAO ZHANG (Author)

03 The Metro Railway Corporation and Maintenance ACT 2002

PART A – Act

Indian Railway Board Act, 1905

The Railways Act, 1989

Railway Protection Force Act, 1957

PART B – Codes

Indian Railways Administration and Finance an Introduction

Indian Railways Code for the Accounts Department Part - I

Indian Railways Code for the Accounts Department Part – II

Indian Railways Establishment Manual Volume-I

Indian Railways Establishment Manual Volume-II

Indian Railway Commercial Manual Volume-I

SEMESTER V

Savitribai Phule Pune University, Pune
TE Civil (2019 Pattern) w. e. f. June 2021
Honors in* Metro Construction

301302: Surveying in Metro construction: Lab

Teaching scheme	**Credit**	**Examination scheme**
Practical: 02 Hours/week	01	TW: 50 Marks

Any Eight experiments

1. To transfer level from permanent benchmark to different location of metro project.
2. Setting out curve of metro alignment.
3. Setting out closed traverse as a reference line for metro construction.
4. Setting out of foundation for metro line.
5. Transfer of Centre line on Pile cap.
6. Metro alignment details on AutoCAD sheet.
7. Visit to completed metro project.
8. Hydrographic survey on riverbed for metro alignment.
9. GIS analysis for metro alignment.
10. Visit to ongoing Metro construction project

SEMESTER VI

Savitribai Phule Pune University, Pune

TE Civil (2019 Pattern) w. e. f. June 2021

Honors in* Metro Construction

301303: Planning and Quantity estimation for metro construction

Teaching scheme	**Credit**	**Examination scheme**
Lectures: 04 Hours/week	04	In semester exam: 30 Marks
		End semester exam: 70 Marks

Course Contents

Unit I: Preparation of plans and estimates of Metro Railway (08 Hours)

Metro railway of infrastructure; Typical Metro railway planning steps; Planning and appraisal of major Metro railway projects; Screening of project ideas; Life cycle analysis of Metro railway; Multi-criteria analysis for comparison of Metro railway construction alternatives; Procurement strategies; Scheduling and management of planning activities of construction.

Preparation of plans and estimates: Preparation of Plans General procedure; preparation of plans, sizes of drawings; titles and numbering of drawings; scale of drawings; details on drawings; symbols and colours of drawings. Preparation of Estimates - Preparations of estimates – Code rules; technical details, rates and quantities; schedule of rates and price, special features of estimates; Supplementary Estimates.

Unit II: Economic Analysis of Metro Railway Project (08 Hours)

Economic Analysis of Metro Railway Project– Concepts and Applications, Principles of methodologies for economic analysis of public works, Social welfare function, indifference curves and tradeoffs, Demand curves and price elasticity's; Benefit-cost ratio and internal rate of return; Shadow pricing; Accounting for risk and uncertainty;

Unit III: Acquisition of Land ACT of Metro Railway (08 Hours)

ACT and Policies relevant of Project, Right of Fair Compensation and Transparency in Land Acquisition and resettlement and rehabilitation ACT 2013, Maharashtra guidelines and Rules for Land Acquisition.

Unit IV: Details Estimate of Metro construction projects (08 Hours)

Elevated section (viaduct), Underground section by Tunnel Boring Machine (TBM) excluding station box, Underground section by Cut and Cover, Station Buildings, Elevated Station excluding viaduct (Civil work), Elevated station (E&M work including lift and escalator), Underground station (Civil work), Underground station (E&M work including ECS, TVS, Lift and Escalator), Permanent way

Unit V: Financial Evaluation of Metro Railway (08 Hours)

Financial Evaluation - Time value of money, Investment criteria, Project cash flows – elements and basic principles of estimation, Financial estimates and projections, Cost of capital, Rate of return; Project risk analysis; Political and social perspectives of infrastructure planning; Case studies

Unit VI: Construction Contracts (08 Hours)

Construction Contracts of Metro Railway Project - Contract Specifications, types of contract documents used for construction, Contract Procurement - selecting a contractor, Introduction to BOT and BOOT projects, EPC contracts

Text Books

01 Projects: Planning, analysis, selection, financing, implementation, and review, P. Chandra, Tata McGraw-Hill, New Delhi, 2009.

02 Project financing - Asset-based financial engineering, J. D. Finnerty, John Wiley & Sons, New York, 1996.

03 Infrastructure planning handbook: Planning, engineering, and economics, A. S. Goodman and M. Hastak, McGraw-Hill, New York, 2006

04 Infrastructure planning, J. Parkin and D. Sharma, Thomas Telford, London, 1999.

05 Laws Relating to Building and Engineering Contracts in India, Gajaria G.T., M.M. Tripathi Private Ltd., Bombay, 1982.

06 Computer-based construction project management, T. Hegazy, Prentice Hall, New Jersey, 2002.

07 Project management in construction, 5th ed., S. M. Levy, McGraw Hill, New York, 2007.

08 A guide to the project management body of knowledge, PMI, 3rd ed., Project Management Institute, Pennsylvania, 1996.

09 Planning and controlling construction projects, M. Mawdesley, W. Askew and M. O'Reilly, Addison Wesley Longman Limited, Essex, 1997.

10 Value management of construction projects, J. Kelly, S. Male and D. Graham, Blackwell Publishing, Oxford, 2003.

11 Handbook of Construction Management, Joy P.K, Mac Millan Publications, 1991