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Transportation Engineering — Complete Syllabus

BTEUP Diploma in Civil Engineering • 5th Semester • Session 2026-27

Subject 5.1 (Theory) + 5.7 (Lab) • Total 200 Marks • 4 Credits

About this document: Transportation Engineering appears twice in the 5th semester — as a theory paper (5.1) and as a lab (5.7). Both are covered here, completely, in the official order. The scheme table spells the subject “TRANSPORATION ENGG.”; the subject pages spell it “TRANSPORTATION ENGINEERING”.

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
5.1	Transportation Engineering	Theory	2 - 0	2	Theory 40	Theory 60 (3 hrs)	100
5.7	Transportation Engineering Lab.	Practical	0 - 4	2	Practical 60	Practical 40 (3 hrs)	100
Transportation Engineering Total				4	100	100	200

What This Subject Aims To Do

To identify the types of roads as per IRC recommendations, understand the geometrical design features of different highways, perform different tests on road materials, and identify the components of railway tracks.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
1	Overview of Transportation Engineering	3	15%
2	Geometric Design of Highway	8	20%
3	Construction of Road Pavements	8	30%
4	Basics of Railway Engineering	5	15%
5	Track Geometrics, Construction and Maintenance	4	20%

Unit 1 — Overview of Transportation Engineering (3 Periods, 15%)

Topics: Role of transportation in the development of nation, scope and importance of roads in India and its characteristics; functions of IRC, CRRI, MoRT & H, NHAI; different modes of transportation — land way, waterway, airway; general classification of roads; selection and factors affecting road alignment.

Unit 2 — Geometric Design of Highway (8 Periods, 20%)

Topics: Camber: definition, purpose, types as per IRC — recommendations; kerbs: road margin, road formation, right of way; design speed and various factors affecting design speed as per IRC — recommendations; gradient: definition, types as per IRC — recommendations; sight distance (SSD): definition, types, intermediate sight distance and over taking sight distance, IRC — recommendations, simple numerical; curves: necessity, types: horizontal, vertical curves; extra widening of roads: numerical examples; super elevation: definition, formula for calculating minimum and maximum super elevation and method of providing super-elevation; standards cross-sections of national highway in embankment and cutting.

Unit 3 — Construction of Road Pavements (8 Periods, 30%)

Topics: Different types of road materials in use: soil, aggregate and binders and their tests — CBR, test on aggregates — flakiness and elongation index tests, impact value, abrasion value, aggregate crushing value; test on bitumen — penetration, ductility, flash and fire point test and softening point test; pavement — definition, types, structural components of pavement and their functions; construction of WBM road; merits and demerits of WBM and WMM road; construction of flexible pavement / bituminous road, types of bitumen and its properties, emulsion, cutback, tar, terms used in bituminous road — prime coat, tack coat, seal coat, merits and demerits of bituminous road; cement concrete road — methods of construction, alternate and continuous bay method, construction joints, filler and sealers, merits and demerits of concrete roads, types of joints; pavement maintenance and highway drainage; road construction machinery: paver, roller, excavator, grader, bulldozer, hot mix plant, dumper, drag line, backhoe etc.

Unit 4 — Basics of Railway Engineering (5 Periods, 15%)

Topics: Classification of Indian Railways, zones of Indian Railways; mass transit system; permanent way: ideal requirement, components; rail gauge, types, factors affecting selection of a gauge; rail, rail joints — requirements, types; creep of rail: causes and prevention; sleepers — functions and requirement, types — concrete sleepers and their density; ballast — function and types, suitability; rail fixtures and fastenings — fish plate, spikes, bolts, keys, bearing plates, chairs — types of anchors and anti-creepers.

Unit 5 — Track Geometrics, Construction and Maintenance (4 Periods, 20%)

Topics: Alignment — factors governing rail alignment; track cross sections — standard cross section of single and double line in cutting and embankment; important terms — permanent land, formation width, side drains; railway track geometrics: gradient, curves — types and factors affecting, grade compensation, super elevation, limits of super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail; branching of tracks, points and crossings, turn out — types, components, functions and inspection; track junctions: crossovers, scissor cross over, diamond crossing, track triangle; station — purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station; station yard: classification — passenger, goods, locomotive and marshalling yards; function and drawbacks of marshalling yards; track maintenance — necessity, classification, tools required for track maintenance with their functions, organisation of track maintenance, duties of permanent way inspector, gang mate and key man.

Practical Work

- California Bearing Ratio (CBR) Test.
- Flakiness and Elongation Index of aggregates.
- Angularity Number of aggregates.
- Aggregate impact test.
- Los Angeles Abrasion test.
- Aggregate crushing test.
- Softening point test of bitumen.
- Penetration test of bitumen.
- Flash and Fire Point test of bitumen.
- Ductility test of bitumen.
- Visit to railway track for visual inspection of fixtures, fasteners and yards.
- Prepare the photographic report containing details for experiment No. 11.

Reference Books (as listed in the syllabus)

- L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93-82609-858), Edition 2018.
- Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
- Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
- Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
- Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg, Standard Book House, New Delhi.
- Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand Publication, New Delhi.
- Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
- Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.
- D.V.Gupta, Vikram Singh, Transport Engineering -I, Asian Publishers, Muzaffarnagar, ISBN No. 978-93-5502-113-7.

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Source: BTEUP 3rd Year curriculum (folder2627), approved in C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text.

Please confirm with your own polytechnic for any local changes.