



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3170619

Subject Name: Railway and Airport Engineering
Semester – VII

Type of course: Professional Elective Course V

Rationale:

Railway is important mode of surface transportation. Railways are economic for the long-distance transportation of passengers and freight on the land. India has the second largest Railway network in the world. At present in the India, the share of goods transportation in railway is reduced than the roadways. There is a very good scope of developing high speed trains and special corridors for freight transportation in India. The course covers fundamental knowledge of component parts, their function, design of track and overall operation of Railways.

Airports are important infrastructure for economic growth of any country. It requires large scale planning, design and construction. It requires huge amount of investment. Precise engineering skill is required for the planning, design, construction and maintenance of Airport structures. The course covers the fundamental knowledge of various important elements of Airport Engineering. It includes the planning and design of Airports.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	RAILWAY ENGINEERING: Module 1: General: Development of railways in India, Permanent way and railway track components, different gauges in India, conning of wheels, Functions of various Components - Rails, Sleepers and Ballast, Rails - types of rails, rail sections, defects in rails, creep of rails, rail fixtures and fastenings, rail joints and welding of rails, sleepers – types, spacing and density, Ballast – types, advantages and disadvantages, Subgrade – Requirement, embankment.	8
2	Module 2: Geometric design of railway track: gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves. Track layouts, Switches, Tongue Rails, Crossings, Layout of Turnout – Double Turnout, Diamond crossing, Scissors crossing.	5
3	Module 3: Railway station and Yard: Railway traction and track resistance, stresses in railway track – rails, sleepers, ballast. Points and crossings – turnouts, switches, crossings. Track junctions – types, splits,	8



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	diamond, gauntlet, scissor crossovers. Railway stations - requirements, facilities, classifications, platforms, loops, sidings. Railway yards – types, required equipment in yards. Signaling and control system – objectives, classification, Interlocking of signals and points.	
4	AIRPORT ENGINEERING: Module 4: General: History, development, policy of air transport, aircrafts, aerodromes, air transport authorities, air transport activities, air crafts and its characteristics, airport classifications as per ICAO.	1
5	Module 5: Airport Planning: Regional planning-concepts and advantages, location and planning of airport as per ICAO and FAA. Airport Master plan, Airport site selection, Zoning laws, Airport Elements -airfield, terminal area, zoning laws, classification of obstructions, approach zone, turning zone, airport capacity, runway capacity, estimation of future air traffic, development of new airport, requirements of an ideal airport layout.	6
6	Module :6 Run Way Design: Wind rose and orientation of runway, wind coverage and crosswind component, factors affecting runway length, basic runway length and corrections to runway length, runway geometrics and runway patterns (configurations), Runway marking, threshold limits cross section of runway. Taxiway Design: Controlling factors, taxiway geometric elements, layout, exit taxiway, location and geometrics, holding apron, turnaround facility. Aprons -locations, size, gate positions, aircraft parking configurations and parking systems, hanger -site selection, planning and design considerations, Fuel storage area, blast pads. Wind direction indicator. LCN system of Pavement Design, Airfield Pavement – Failures, Maintenance and Rehabilitation.	8
7	Module 7: Terminal Area: Elements and requirements, terminal building functions, space requirements, location planning concepts, vehicular parking area and circulation network	2
8	Module 8: Grading and Drainage: Airport grading -importance, operations, airport drainage aims, functions, special characteristics, basic requirements, Deign of drainage - surface and subsurface drainage systems,	2
9	Module 9: Air Traffic Control and Visual Aids: Need of Air traffic control, Air traffic control network, Air traffic control aids -landing information system, airport markings and lighting.	2

Course Outcomes: At the end of the course, Student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Know about railway track components, their materials, size, function and importance	20



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CO-2	Carry out geometric design of railway track	20
CO-3	Recognize about various components in diverging, merging and crossings of railway tracks, stations, yards, signaling, interlocking and control systems.	20
CO-4	To understand the fundamentals of planning and design of Airport structures.	10
CO-5	To design of runway and taxiways for Airport	20
CO-6	To comprehend the use of Air Traffic Control and Visual Aids in the air traffic operation.	10

Suggested Specification table with Marks (For BE only):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20%	20%	20%	20%	10%	10%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Satish Chandra and M.M. Agrawal, "Railway Engineering", Oxford University Press, New Delhi
2. S.C. Saxena and S. P. Arora, "A Text Book of Railway Engineering", Dhanpat Rai & Sons, New Delhi
3. S.C. Rangwala, K.S. Rangwala and P.S. Rangwala, "Principles of Railway Engineering", Charotar Publishing House, Anand.
4. Dr. S. K. Khanna, M.G.Arora and S.S. Jain, "Airport Planning & Design", Nem Chand & Bros., Roorkee
5. G.V. Rao, "Airport Engineering", Tata McGraw Hill Pub. Co., New Delhi
6. S.C. Rangwala, P. S. Rangwala, "Airport Engineering", Charotar Publishing House Pvt. Ltd, Anand
7. Robert Horonief, Francis X. McKelvey, William J. Sproule, Seth B. Young, "Planning & Design of Airports", Mc Graw Hill Publication.
8. Arora S. P. and Saxena (2001), "Railway Engineering", Dhanpat Rai Publishers, New Delhi, 2001
9. Seth Young, Alexander T. Wells, "Airport Planning & Management", Macgraw Hill Professionals
10. Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, "Airport Engineering: Planning, Design and Development of 21st Century Airports", John Wiley & Sons
11. Richard de Neufville, Amedeo Odoni, " Airport System: Planning, Design and Management", Mc Graw Hill Education.



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List of Assignments based on:

1. Component parts of Railway track, importance and their functions
2. Geometric design of railway track
3. Signal control system of Railway
4. Runway and Taxiway design of Airport
5. Terminal area, parking and drainage system at Airfield
6. Air Traffic Control and Visual Aids

Technical Visit:

- 1) The visit of any Railway station and yard should be carried out for understanding the components of track and overall operation of Railway.
- 2) The visit of Airport site should be carried out to understand the various structures, its construction and operations.