



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-6(B. Tech.)

Subject: Railway and Airport Engineering–BETCV16328

Type of Course: Professional Core

Prerequisite: Knowledge of Transportation engineering

Rationale: Railways and airports are two critical transportation systems that play a key role in the economic growth, connectivity, and mobility of a country. Railways are a cost-effective mode for long-distance passenger and freight transport. India has the second largest railway network in the world, providing essential connectivity across regions. Airports are vital infrastructure for national and international connectivity and require extensive planning, precise engineering, and large-scale investment. Proper airport design ensures safe, efficient, and sustainable operations. This course introduces students to the key elements of airport engineering

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Course Content:

Sr.No.	CourseContent	Hrs.	% Weightage
1	Fundamental of Railway Engineering 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.	10	15
2	Design of Railway station components gradients, grade compensation, speed of trains on curves, super elevation, can't deficiency, negative super elevation, curves, widening on curves. Track layouts, Switches, Tongue Rails, Crossings, Layout of Turnout, Double Turnout. Railway traction and track resistance, stresses in railway track, rails, sleepers, ballast. Points and crossings, switches, crossings. Track junctions, types, Railway stations Requirements, facilities. Railway yards –Signaling and control system – objectives, classification, Interlocking of signals and points.	15	30
3	Fundamental of Airport Engineering History, development, policy of air transport, aircrafts, aerodromes, air transport authorities, air transport activities, air crafts and its characteristics, airport classifications as per ICAO. 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.	10	15
4	Design of Airport Terminal components 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. 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. elements and requirements, terminal building functions, location planning concepts, vehicular parking area and circulation network.	15	25
5	Airport Maintenance and Air Traffic Management Grading and Drainage: Airport grading-importance, operations, airport drainage aims, functions, special characteristics, basic requirements, Design of drainage - surface and subsurface drainage systems, Air Traffic Control and Visual Aids: Need of Air traffic control, Air traffic control network, Air traffic control aids, airport markings and lighting.	10	15



Course Outcome:

After learning the course, the students should be able to:	
CO1	Explain the development of railways in India and identify components of the permanent way and track system.
CO2	Analyze the design aspects of railway stations, gradients, curves, and track layouts.
CO3	Evaluate railway traction, track resistance, stresses, points, crossings, and signaling systems
CO4	Apply principles of airport planning, site selection, master plan preparation, and design of airfield elements.
CO5	Describe the structure and technologies used in Air Traffic Management (ATM)

List of Practical

Sr.No	Descriptions	Unit No.	Hrs.
01	Draw sketches of different railway gauges	01	02
02	Draw different rail sections, sleepers, track fittings, points, and crossings.	02	02
03	Study Existing railway station and yard having all Features and prepare a brief report.	02	04
04	Study railway crossing for signaling and interlocking systems	02	04
05	Prepare track layout diagrams including turnouts, sidings, and loops	02	04
06	Draw elevation and cross-section of railway embankment	02	02
07	Prepare a chart of airport layout showing runway, taxiway, apron, terminal building, ATC tower, hangar, and parking area	03	02
08	Draw runway cross-section and marking diagrams	03	02
09	Prepare taxiway and apron layout with exit taxiway and parking positions	04	04
10	Study air traffic control system and visual aids; draw schematic diagrams	05	04
TOTAL			30

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by blackboard, may also use any of the tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.



Continuous Assessment:

Sr. No.	Active Learning Activities	Marks
1	Model Making of Railway Track Students will be divided into groups to prepare a Railway Track Model using various material (Wooden board / thick thermocol / ply sheet, Metal strips etc.) Through this activity, students are required to understand all the components of a railway track such as rails, sleepers, ballast, and subgrade. After completing the model, each group must take a photograph of their model and upload it on the GMIU Web Portal.	10
2	Case study on Points and Crossings of Railway Track Students are required to prepare a case study showing the layout of a railway turnout, including points (switches) and crossings. The case study should clearly display all major components, including: Tongue Rails, Stock Rails, Nose of Crossing, Check Rails. Students should label each component clearly and use colors or symbols to make the layout visually clear and easy to understand. After completing the case study, students must take a Report and upload it on the GMIU Web Portal.	10
3	Create the Airport Layout Chart Students are required to prepare a chart showing the layout of an airport. The chart should clearly display all major components, including runway, taxiway, apron, terminal building, ATC tower, hangar, and parking area. Students should label each component and use colors or symbols to make the layout clear. After completing the chart, students must take a photograph of their work and upload it on the GMIU Web Portal.	10
TOTAL		30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	20%	30%	15%	15%	10%	10%

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] Railway Engineering, Satish Chandra and M.M. Agrawal, Oxford University Press, New Delhi
- [2] Railway Engineering, Arora S. P. and Saxena (2001), Dhanpat Rai Publishers, New Delhi, 2001
- [3] Airport Engineering, S.C. Rangwala, P. S. Rangwala, Charotar Publishing House Pvt. Ltd, Anand
- [4] Airport Planning & Design, Dr. S. K. Khanna, M.G. Arora and S.S. Jain, Nem Chand & Bros., Roorkee
- [5] Airport System: Planning, Design and Management, Richard de Neufville, Amedeo Odoni, Mc Graw Hill Education



