

**SECOND SEMESTER 2023-2024**

# Course Handout

Date: 09-01-2024

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CE F425

## Course Title : Airport, Railways and Waterways

## Instructor-in-Charge : V Vinayaka Ram

**1. Scope and Objective of the Course:**

This course introduces Airports, Railways and Waterways Engineering as a part of Transportation Engineering, including an introduction to Tunnel Engineering. The course deals with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage. It introduces the students to component of railway tracks, train resistance, crossing, signaling, high speed tracks and Metro Rail. It explains the classes of harbors, features, planning and design of port facilities. The student will be introduced to necessity of tunnels, ventilation, lighting and drainage.

**2. Course Outcomes:**

At the end of this course, the students will develop:

1. Ability to design runways and taxiways.
2. Ability to plan small and large airports
3. Ability to design various crossings and signals in Railway Projects.
4. Ability plan the harbors, ports and tunnels operations

Student Learning Outcomes (SLOs) assessed in this course – (a), (b), (c), (d), (e), (h), (j), and (k).

**3. Text Books:**

T1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)

T2. R. Srinivasan (2018), [Harbour, Dock and Tunnel Engineering](http://jainbookagency.com/newdetails.aspx?id=35694) 29th Edition, Charotar Publishing House Pvt. Ltd.

# T3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)

**Reference Books:**

R1. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.

R2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017

**4. Course Plan:**

| Lecture No. | Learning objectives | | Topics to be covered | Chapter in the Text Book | SLO |
| --- | --- | --- | --- | --- | --- |
| **I. Airport Engineering** | | | | | |
| 1-2 | Study the history and development of aircraft operations | | Introduction : History of aviation, development of aircrafts and their operating characteristics, Basic components of an airport | T1- Chapter 1 and R1-Chapter 1 | (a) |
| 3-5 | Learn to plan an airport | | Master planning of Airport, Planning and Forecasting Future air traffic, Site Selection for airports | T1- Chapter 3 and R1-Chapter 4 and Chapter 5 | (a) |
| 6-8 | Ability to plan the orientation of Runway | | Runway orientation, Basic Runway obstructions, Imaginary Runway surfaces, Wind configurations, Wind rose diagrams | T1- Chapter 5 and Chapter 6 | (a), (c), (d), (e) |
| 9-12 | Ability to decide about runway length | | Landing and Take-off length requirements, Different factors influencing runway length, Types of runways and characteristics | T1- Chapter 7 | (a), (c), (d), (e) |
| 13-16 | Ability to design geometric components of Taxiways | | Types of taxiways, geometric design of taxiways, Taxiway length, width characteristics, Terminal buildings, aprons | T1- Chapter 8 | (a), (c), (d), (e) |
| 17-18 | Ability to design the flexible Airfield pavements | | Basic design principle, FAARFIELD design criteria, factors affecting flexible runways, Gear configuration, Equivalent Single Wheel load concept, Design Example | T1- Chapter 10 and R1-Chapter 7 | (a), (c), (d), (e) |
| 19-20 | Ability to design Rigid Airfield pavements | | Basic design principle, FAARFIELD design criteria, factors affecting rigid runways, CAN and PCN concepts, Design Example | T1- Chapter 10 | (a), (c), (d), (e) |
| 21 | Identify and understand the functions of airport drainage | | Drainage: Airport drainage, surface drainage, sub-surface drainage, environmental impacts | T1- Chapter 18 | (a) |
| **II. Railway Engineering** | | | | |  |
| 22 | Study the history and development of railway transportation, identify the stresses in railway tracks, design the joints in rail sleepers | | Railway transportation and its development, Railway terminology | T3 – Chapter1 to 3 | (a) |
| 23 | Stresses in Railway Track Traction and Tractive Resistances | T3 – Chapter 4 | (a) |
| 24 | Rail Joints: Welding of Rails, Creep of Rails Sleepers | T3 – Chapter 7 to 9 | (a) (f) |
| 25 | Track Fittings and Fastenings | T3 – Chapter 10 | (a) (i) |
| 26 | Ballast | T3 – Chapter 11 | (a) (b) (f) |
| 27 | Subgrade and Embankments | T3 – Chapter 12 | (a) (b) (c) |
| 28 | Points and Crossings | T3 – Chapter 16 | (a) (i) |
| 29 | Track Junctions | T3 – Chapter 17 | (a) (i) |
| 30 | Stations and Yards, Equipment in Station Yards | T3–Chapters 18, 19 | (a) |
| 31 | Signaling and Control System | T3 – Chapter 20 | (a) (f) (h) |
| 32 | Interlocking of Signals and Points | T3 – Chapter 21 | (a) |
| 33 | Maintenance of Tracks | T3 – Chapter 24 | (a) |
| 34 | Safety in Railways | T3 – Chapter 26 | (a) (h) (i) |
| 35-36 | Learn the fundamentals of geometric design of railway tracks | | Introduction to geometric design of tracks, railway curves | R2- Chapter 6 |  |
| 37 | Introduction to high speed railway system | | Modern Developments in Railways Development of High and Super High Speeds Modernization of Track for High Speeds Modern Methods of Track Maintenance | R2- Chapter 18 | (a) (b) |
| **III. Waterways Engineering** | | | | | |
| 38 | Designing the facilities for good ports | | Ports and Harbors: Classification of Harbors and Ports, Requirements of a good port; facilities at a major port | T2 – Chapter 1 | (a) (h) |
| 39 | Identify the differences between wet docks and dry docks and their functions | | Introduction to docking facilities with special reference to wet docks, Introduction to Graving dry docks | T2 – Chapter 4 and chapter6 | (a) (c) |
| 40 | Identify difference between dolphins and jetties | | Approach, Loading and Unloading facilities: Introduction to entrance locks, quay walls, wharves, pier heads, dolphins, jetties, fenders, slip and moles | T2 – Chapter 8, Chapter 9 | (a) (c) |
| **IV. Tunnel Engineering** | | | | | |
| 41-42 | | Understand Tunneling and related engineering aspects | General aspects, advantages of tunneling, Tunnel approaches, Timber lining, concrete lining, stone masonry | T2- Chapter 13 and Chapter 14 | (a) (c) |

**\*Student Learning Outcomes (SLOs):**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

1. an ability to apply knowledge of mathematics, science and engineering
2. an ability to design and conduct experiments, as well as to analyze and interpret data
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. an ability to function on multidisciplinary teams
5. an ability to identify, formulate, and solve engineering problems
6. an understanding of professional and ethical responsibility
7. an ability to communicate effectively
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. a recognition of the need for, and an ability to engage in life-long learning
10. a knowledge of contemporary issues
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**5. Evaluation Scheme:**

| **Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| --- | --- | --- | --- | --- |
| Mid-Semester Examination | 90 | 30 | 15/03 - 11.00 - 12.30PM | OB |
| Take home Assignments | continuous | 10 | - | OB |
| In-class Assessments | continuous | 10 | - | OB |
| Quiz | 50 | 15 | Will be announced in the class | OB |
| Comprehensive Exam | 180 | 35 | 16/05 AN | Partially CB and Partially OB |

**Chamber Consultation Hour:**

Will be announced during the 1st class. However, students are encouraged to visit the instructor any other free time and discuss the course contents.

**Notices:**

Notices will be displayed on CMS.

**Make-up Policy:**

1. Make-ups will be granted only for genuine reasons like medical emergencies. However, prior permission is a must.
2. Applications received 24 hours after the test will not be entertained. Applications on informal forums like Face Book / WhatsApp will be ignored
3. For medical cases, a certificate from the concerned physician of the Medical Centre must be produced in addition to the prescriptions and other investigation reports. Cross verification also will be done with Hostel Superintendent / Warden before approving the makeup request.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-Charge

CE F425