



# Birla Institute of Technology & Science, Pilani

Hyderabad Campus

SECOND SEMESTER 2020-2021

Course Handout

Date: 16-01-2021

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 : Bandhan Bandhu Majumdar

### 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.

**Course Outcome:** At the end of this course, the students will develop:

1. An ability to design of runways and taxiways.
2. An ability to design the infrastructure for large and small airports
3. An ability to design various crossings and signals in Railway Projects.
4. An ability plan the harbors, ports and tunnel projects

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

### 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 29<sup>th</sup> 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 Mundry, Railway Track Engineering (5<sup>th</sup> Edition) McGraw Hill Education 2017



## Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book	SLO
<b>Airport Engineering</b>				
1-3	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)
4-6	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)
7-8	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 design runway	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 Taxiways and other airport components	Types of taxiways, geometric design of taxiways, Taxiway length, width characteristics, Terminal buildings, aprons, Requirement of airport gates	T1- Chapter 8	(a), (c), (d), (e)
17-18	Ability to design Flexible Airfield pavements	Basic design principle, FAARFIELD design criteria, factors affecting flexible runways, Gear configuration, Equivalent Single Wheel load, Design Examples	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, ACN, PCN, Design Examples	T1- Chapter 10	(a), (c), (d), (e)
21	Identify the components of drainage	Drainage: Airport drainage, surface drainage, sub-surface drainage, environmental impacts	T1- Chapter 18	(a)
<b>Railway Engineering</b>				
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 – Chapter 1 to 3	(a)
23		Stresses in Railway Track Traction and Tractive Resistances Rails	T3 – Chapter 4	(a)
24		Rail Joints and 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 – Chapter 18 to 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 Track	T3 – Chapter 24	(a)
34		Safety in Railways	T3 – Chapter 26	(a) (h) (i)
35-36	Learn geometric design of railway tracks	Geometric design of tracks, Railway curves	R2- Chapter 6	
37	Design 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)
<b>Waterways Engineering</b>				
38	Designing the facilities for good ports	<u>Ports and Harbors:</u> Classification of Harbours 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 chapter 6	(a) (c)
40	Identify difference between dolphins and jetties	<u>Approach, Loading and Unloading facilities:</u> Introduction to entrance locks, quay walls, wharves, pier heads, dolphins, jetties, fenders, slip and moles	T2 – Chapter 8, Chapter 9	(a) (c)
<b>Tunnel Engineering</b>				
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.

- (a) an ability to apply knowledge of mathematics, science and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) 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
- (d) an ability to function on multidisciplinary teams



- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

#### Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-Sem	90	25	01/03 11.00 - 12.30PM	OB
Take home Assignments	continuous	10	-	OB
Term Paper	-	10	-	OB
Surprise Quiz (2)	30	15	Surprise Quiz	OB
Comprehensive Exam	120	40	01/05 AN	OB

#### Chamber Consultation Hour:

There is no such fixed consultation hour; you can email me for any query or fixing an appointment

#### Notices:

Notices will be displayed on Google Classroom.

#### 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 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 proceeding further with the application.

**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**

