Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2020-2021

Course Handout

Date: 15-01-2022

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

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. 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).

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 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

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book	SLO
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)
Railway Engineering				
22	Study the history and development	Railway transportation and its development, Railway terminology	T3 – Chapter1 to 3	(a)

23	of railway transportation, identify the stresses in railway tracks, design the joints in rail sleepers	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	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)
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)
Tunnel Engineering				
41-42	Understand Tunneling and related engineering	General aspects, advantages of tunneling, Tunnel approaches, Timber lining, concrete lining, stone masonry	T2- Chapter 13 and Chapter 14	(a) (c)

	aspects			

***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-Semester Examination	90	30	10/03 11.00am to12.30pm	OB
Take home Assignments	continuous	10	-	OB
Term paper	-	10	-	OB
Quiz	50	15	Will be announced in the class	OB
Comprehensive Exam	120	35	06/05 AN	CB

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 Google Classroom / 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