



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

COURSE DESCRIPTION FORM

Course Title	TRANSPORTATION ENGINEERING – II			
Course Code	A70143			
Regulation	R15 – JNTUH			
Course Structure	Lectures	Tutorials	Practicals	Credits
	4	-	-	4
Course Coordinator	Ms. K. Anusha Hadassa, Assistant Professor, Dept of CE			
Team of Instructors	Ms. K. Anusha Hadassa, Assistant Professor, Dept of CE			

I. COURSE OVERVIEW:

The course introduces various modes of transportation systems like railways, Airways, Seaports and harbours. It addresses the various requirements to be provided for effective functioning of these systems. It also imparts knowledge regarding various components like (i) Rails, sleepers, ballast, signals super elevations etc in railways, (ii) Runways, Taxiways, Aprons, Terminal building facilities, Airport considerations signage's etc (iii) jetties, ware houses, Break waters piers etc. It also helps in understanding how each system functions their importance and limitations. Standards framed by various bodies for the smooth and convenient functioning of various components, design and implementations. The course also introduces to various advanced technologies used in transportation like ITS.

II. PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	4	4	Transportation engineering I

III. MARKS DISTRIBUTION:

Sessional Marks	University End Exam marks	Total marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper, objective paper and assignment. The essay paper is for 10 marks of 60 minutes duration and shall contain 4 questions. The student has to answer 2 questions, each carrying 5 marks. The objective paper is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 fill-in-the-blank questions, the student has to answer all the questions and each carries half mark. First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion.	75	100

Sessional Marks	University End Exam marks	Total marks
Five marks are earmarked for assignments. There shall be two assignments in every theory course. Assignments are usually issued at the time of commencement of the semester. These are of problem solving in nature with critical thinking. Marks shall be awarded considering the average of two midterm tests in each course.		

IV. EVALUATION SCHEME:

S. No	Component	Duration	Marks
1.	I Mid Examination	80 minutes	20
2.	I Assignment	-	5
3.	II Mid Examination	80 minutes	20
4.	II Assignment	-	5
5.	External Examination	3 hours	75

V. COURSE OBJECTIVES:

The objective of the teacher is to impart knowledge and abilities to the students to:

- I. Introduce different transportation systems and their importance and their role in development
- II. Understand standards and norms of National and International organisations which are framed for efficient functioning of existing transport systems
- III. Impart Knowledge regarding the functioning of various components like rails, sleepers, Tracks, Geometric curves, Runways, Taxiways Aprons Wear houses, Jetties etc
- IV. Design elements like horizontal curves, vertical curves, super elevation etc
- V. Analyze how signal systems ,visual aids and Markings etc help in safe working of transportation systems

VI. COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

1. Gain knowledge regarding various specifications and standards set by organisations and official bodies.
2. Differentiate the working of various transport systems and their working in different scenarios
3. Understanding the functions of various components in Rail, Air, Water transport systems and their importance.
4. Capable of carrying out surveys needed to be done while constructing Railways Airports and seaports
5. Have a in depth knowledge on curve sections super elevations and many other design elements
6. Explain the working of various design elements used in different Transport systems
7. Calculate entities like maximum permissible loads on rails ,degree of curves, permissible speeds on various gauges etc
8. Prepare master plans for Airports, harbour site considering natural phenomenon and different harbour railway airport elements
9. Exposure to new technologies which are currently in use for safe and efficient travel
10. Predict the upcoming trends and changes which are likely to take place in transport and travel modes.
11. Introduce the recent advancements in the field of Sustainable Urban Development, Traffic Engineering and Management, Systems Dynamics Approach to Transport Planning
12. Participate and succeed in competitive examination like GATE, PSUs and IES etc.

VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency Assessed by
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	H	Assignments, Exams
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Assignments, Exams
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	S	Assignments
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	-	-
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	-	-
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	-	-
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	-	-
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	-	-
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	-	-
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	S	Lectures, Discussions
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	-	-
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	-	-

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VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	Engineering Knowledge: Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.	H	Lectures, Assignments, Exams
PSO2	Broadness And Diversity: Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.	H	Lectures, Assignments, Exams
PSO3	Self-Learning And Service: Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.	-	-

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VIII. SYLLABUS:

Unit - I

INTRODUCTION TO RAILWAY: Permanent way components –Cross section of permanent way- Functions of various components like rails, sleepers and ballast, Gauge –Creep of rails – Theories related to creep – sleeper density

Unit - II

GEOMETRIC DESIGN OF RAILWAY TRACK: Gradients – Grade compensation – Cant and Negative super elevation–Cant deficiency– Degree of curve – Points and crossings ,Rail joints and welding of joints, Railway stations and yards, Signalling and interlocking

Unit - III

AIRPORT ENGINEERING: Airport site selection– Runway orientation–Basic Runway length-Corrections for elevation, Temperature-Airport classification –Runway geometric design–Factors controlling Taxiway Layout–Terminal Area–Apron–Hanger–Blast considerations, Typical Airport Layouts– Wind rose diagram–Runway lighting system and marking

Unit - IV

Port and Harbour Engineering: Requirements of Port and Harbour – Classification of port and Harbour. Features of a Harbour, Planning of Harbour, Breakwaters, Dry docks, jetties, Aprons, Transit shed and warehouses, Navigational aids, Maintenance of Port and Harbours, Inland water Transport.

Unit - V

Intelligent Transport Systems: ITS definition, Benefits of ITS, user services, Detectors, Automatic Vehicle location (AVL), Introduction to ITS applications; Advanced Traffic Management systems (ATMS), Advanced Public Transportation systems (APTS), ITS architecture components and standards, Overview of ITS implementations in developed countries.

Textbooks:

1. Satish Chandra and Agarwal, M.M (2007) “Railway Engineering” Oxford Higher Education, University Press New Delhi.
2. Airport Planning and Design S. K khanna and M.G Arora, Nemchand Bros.
3. A Text book of transportation Engineering – S.P. Chandola S.Chand &Co.Ltd (2001)
4. Transportaion Engineering and Planning C.S Papacostas, P.D Prevedouros.

Reference Books:

1. A Text book of railway Engineering S.C Saxena and S.Arora, Dhanpatri and Sons, New Delhi.
2. Highway, Railway, Airport and Harbour Engineering - K.P. Subramanian.
3. Harbour, Dock and Tunnel Engineering – R.Srinivasan.
4. Dock and Harbour Engineering - Hasmukh P Oza, Gutam H Oza.

IX. COURSE PLAN:

At the end of the course, the students are able to achieve the following course learning outcomes:

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1-2	Introduction to railway	UNIT1 Explain the importance of railways in connectivity and development. Understand how the railway functions are administered. Various subsidiaries that work in railways etc	T1: 1.1-6, 2.6-8
3-5	Permanent way components	Explain rail gauge system in Indian railways, Feasibilities considerations and limitations Define Permanent way and introduce to its components and explain cross section of a permanent way	T1: 31.37
6-7	Rails	Explain the function of Rails, Types of rail sections Understanding Rail and wheel interaction, Arrangement of wheels in locomotives	T1:81-97
8-9	Sleepers and ballast	Understand the importance of sleepers Explain Requirements of ideal sleepers, Types of sleepers etc Ballast and its considerations	T1: 97-106
10-11	Creep in rails	Understanding Creep in rails Explain causes for creep, problems caused by creep	T1: 191-.193
12	Theories related to creep.	Explain various theories of creep	T1: 191
13	Sleeper density	Explain sleeper density, how it varies for different gauges. Factors that determine sleeper density etc	T1: 106
14	Gradients	UNIT2 Define Gradients, Objectives, types of gradients	T1: 197.-199
15-16	Grade compensation and cant	Explain Grade compensation for different gauges, Various terminology Centrifugal force on a curved track	T1:200
17	Cant deficiency and Negative super elevation	Derive safe speed of trains explain about negative super elevation	T1: 9.6-7
18-20	Degree of curve	Explain about Horizontal curves and Degree of curvature vertical curves and Problems regarding them	T1: 201-233
21-23	Points and crossings	Explain the terminology used in points and crossing, Types of crossings	T1:254-273

		Understanding Turnouts	
24-25	Railway stations and yards	Explain Track junction ,facilities of railway station , classification Requirements of passenger station yards Types etc	T1: 451-466
26-28	Signalizing and interlocking	Understanding the importance of signals .Types of signals on various basis and different classifications	T1: 578-551
29	Various signal systems and interlocking	Explain different terminology and its purpose and importance	T1:551-574
30-31	Introduction to Airport Engineering and Airport site selection	UNIT3 Explain about types of airports, Importance of Air Transport, Factors affecting airport site selection	T2: 8.1.8-8
32	Runway orientation	Define Runway, Aircraft characteristics which influence runway design Elements of runway	T2: 8.2.1.-8.6.3
33	Basic Runway length	Explain different types of runways, Basic runway length,	T2: 8.3.1-8.6.10
34	Corrections for Elevation, temperature	Explain the corrections done in runway design in detailed	T2: 8.6.12-8.6.13
35-37	Taxi ways.	Explain the importance of taxiways location, criteria to be followed in taxiway layout	T2: 8.7.1-8.7.10
38	Terminal area	Understand functions of Terminal Building, Explain components of passenger terminal system	T2: 9.6-7
39	Apron and Hangar	Explain the importance and purposes of Apron and Hangar and their corresponding entities	T2: 9.6-7
40	Airport layout	Explain about various airport layout with international case studies as example	T2:9.6-11
41	Blast considerations	Define various pavements used in runways Explain various specifications	T2: 4.1
42	Wind rose diagram	Explain wind rose diagram Understanding how a runway orientation affected by wind rose diagram Understanding how to read a win rose diagram	T8: 6.6 - 8.6.7
43	Runway Lighting	Requirements for visual aids , Explain about Airport beacon Configurations	T2: 8.7.6-8.7.4
44-45	Runway Marking	Explain Various groups of runway marking	T2: -8.9.3-8.9.5
46	Introduction to water Transportation Requirements of Port and Harbour	UNIT4 Explain about importance of water transportation Basic requirements of ports and harbours	T1: 7.1-3
47	Classification of ports and harbours	Explain various classification of ports and harbours and their basis for classification with necessary examples	T1: 7.4-7

48-50	Features of harbours and ports and planning	Discussion of master plan preparation for ports with an example and necessary features and explanation of various forces of winds, tides etc that act on ships and vessels and various marine structures	T3: 9.6-7
51	Break waters	Importance of break waters, Types of break waters Design criteria etc	T3: 9.6-7
53	Docks	Dry docks and docks purpose and differences	T3:9.6-11
54	Jetties	Types of jetties and purpose of jetties, Wharves and Quays and their importance	T3: 9.6-7
55	Transit sheds and ware houses	Explain Transit sheds and wear houses, requirements and purpose	T3: 9.6-7
56-57	Navigational aids	Explain necessity of navigational aids, Light house and construction signals and types of signals	T3:9.6-17
58	Maintenance of ports and harbours and inland water transport	Describe the impact of coastal zones and beach profiles. Justify the need for berth nourishment Describe the function of water houses and the methods to maintain them. Describe the features of protection	T3:9.6-67
59-61	ITS, Benefits, User services	UNIT 5 Explain about ITS, Benefits, Need for ITS, User services 1. Travel and traffic management 2. Public transportation operations 3. Electronic payment 4. Commercial vehicle operations 5. Advance vehicle control and safety systems 6. Emergency management 7. Information management 8. Maintenance and construction management	T4: 12-13
62	Detectors	Explain different types of sensors and detectors	T4: 12.4-14
63-64	Automatic vehicle location and identification Advance traffic management systems	Traffic management Travel information systems Transit vehicle communication and signal priority Dynamic message signs	T4: 12.4-13
65	ITS architecture components and standards	National ITS architecture Evaluation of ITS Logical and physical architectures	T4: 13.19
66	Overview of ITS implementations in developed countries	Case studies regarding various ITS applications world wide	T4: 14.18

IX. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	S	H											H		
II	H	S											H	S	
III													H	S	
IV													S	H	
V			H							S			S	H	

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X. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	S	H											H		
2	H	S											H	S	
3													H	S	
4													S	H	
5			H							S			S	H	
6															
7													H	S	
8										S			S	H	
9			H										S	H	
10	H														
11													H	S	
12			H							S			S	H	

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