Course Name: Railroad Engineering & Design

Course Number: 20583

Credit: 3

Course Content (outline):

1. **Introduction & overview**
   - History of railroad transportation in the world & in Iran, current role of railroad in Iran & other countries, railway organizations and institutes at the national and international levels
   - Advantages and disadvantages of rail transport compared to other modes of transportation, characteristics and specifications of rail transport, freight shipping in the rail system, passenger transportation in the rail system
   - Components of railway systems

2. **Train dynamics**, moving on the rail, Propulsive resistance (Resistance elements, train resistance components, train resistance models, grade & curve resistance)

3. **An introduction to microeconomics, an introduction to the engineering economy, and project evaluation.**

4. **Location problems**
   - Minor location problems, major location problem
   - Types of revenues, costs and limitations in route location problems
   - Optimum railway alignment

5. **Railway tracks & structures**
   - Subgrade
   - Ballast, Cross ties, Slab track
   - Rails, Fastenings and other track materials
   - Turnouts and Crossings, different types of turnouts and intersections
   - Switches
   - Railway stations, basic station types, station characteristics and specifications, station distances
   - Classification yards
   - Depots
   - Other railways structures

6. **Electrification**

7. **Track analysis**

8. **Track geometry**

9. **Signs, communication and Train control systems.**

10. **Motive power**
    - Locomotives and their types, characteristics and performance of various types of locomotives

11. **Fleets and cars**
    - Wagons, various types of freight and passenger cars, Coupling, hooks and connecting rolling stocks

12. **Rail transport Operation**
    - Different levels of planning: strategic, tactical and operational
o Timetables, graphs, train scheduling, blocking problems, operational issues, combined traffic, capacity of railways, railcar Sycle
o Railways statistics and information systems, railways performance criteria

13. Supply analysis
14. Route structure Design
15. Demand analysis
16. Principles of Maintenance management on the railway
17. High-speed trains
o Common types of high-speed trains
18. Urban railways
o needs, specifications and types of urban train systems
19. Other issues raised in the railways
o Introducing some current researches
o Test tracks.

References:
7. Lecture notes, PowerPoint and articles presented or distributed in the classroom.