**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

- Timetables, graphs, train scheduling, blocking problems, operational issues, combined traffic, capacity of railways, railcar Sycle
- 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**

- Common types of high-speed trains

**18. Urban railways**

- needs, specifications and types of urban train systems

**19. Other issues raised in the railways**

- Introducing some current researches
- Test tracks.

**References:**


1. Armstrong, J., The Railroad: what it is, what it does, Simmons-Boardman, 1992.
2. Vuchic, V., Urban Transit, Systems & Technology, John Wiley & Sons, 2007.
3. Hay, William W. Railroad Engineering, John Wiley & Sons, Inc, 1982.
4. Practical Guide to Railway Engineering, AREMA, 2003.
5. Esveld, Coenraad, Modern Railway Track, Second Edition, MRT-Productions, 2001.
6. Pyrgidis, Christos N., Railway Transportation Systems: Design, Construction & Operation, CRC Press, Teylor & Francis Group, 2016.
7. Lecture notes, PowerPoint and articles presented or distributed in the classroom.