INTRODUCTION TO MULTIMODAL URBAN TRANSPORTATION SYSTEMS (SWAYAM)
(Professional Elective- I)

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Summary

Course Type : Elective

Duration : 12 weeks

Category : Civil Engineering

Credit Points : 3

Level : Undergraduate/Postgraduate

Weblink:

https://onlinecourses.nptel.ac.in/noc22_ce70/preview

COURSE OUTLINE :

This course is refined version of the Post-Graduate course (ID6004) "Planning, Operation and Management of Transportation Facilities" which is being currently taught to the students of Infrastructure Design and Management at IIT Kharagpur. The course's primary objectives are to:

1. Identify the sustainability principles in transportation
2. Introduce the concept of Travel Demand Management (TDM)
3. Disseminate the techniques of urban public transit planning, operations and management
4. Imbibe the concepts of non-motorized urban transport
5. Demonstrate the applications in intelligent transportation systems (ITS)

Pre-requisites: None.

Industries Applicable : Urban Local Bodies,Transport Network Companies (TNCs), Public transportation operating companies and administrators

Course layout

Week 1:

Module 1: Overview of urban transportation
- **Lec. 1: Urbanization and Transport (0.5 hr.)**
- **Lec. 2: Key issues in urban transportation (0.5 hr.)**
- **Lec. 3: Challenges in urban transportation (0.5 hr.)**
- **Lec. 4: Travel demand modelling overview (0.5 hr.)**
- **Lec. 5: Vehicular Level of Service (LOS) overview (0.5 hr.)**

Week 2:

Module 2: Public Transportation
- **Lec. 6: Introduction to public transportation (0.5 hr.)**
- **Lec. 7: Basic operating elements of public transportation (0.5 hr.)**
- **Lec. 8: Basic operating elements of public transportation (contd.) (0.5 hr.)**
- **Lec. 9: Bus Transportation (0.5 hr.)**
- **Lec. 10: Bus Transportation (contd.) (0.5 hr.)**

Week 3:

Module 2: Public Transportation
- **Lec. 11: Financing public transportation (0.5 hr.)**
- **Lec. 12: Transit marketing (0.5 hr.)**
- **Lec. 13: Rail transportation (0.5 hr.)**
- **Lec. 14: Intermediate Public Transportation (0.5 hr.)**
- **Lec. 15: Measuring performance of transit systems (0.5 hr.)**

Week 4:

Module 2: Public Transportation
- **Lec. 16: Advanced operation concepts of public transportation (0.5 hr.)**
- **Lec. 17: Bus & Rail Transit Capacity (0.5 hr.)**
- **Lec. 18: Bus & Rail Transit Capacity (contd.) (0.5 hr.)**
- **Lec. 19: Station Capacity (0.5 hr.)**
- **Lec. 20: Transit Stop Location (0.5 hr.)**

Week 5:

Module 3: Non-Motorised Transportation (NMT) Planning
- **Lec. 21: Introduction to NMT Systems (0.5 hr.)**
- **Lec. 22: Assessing existing NMT scenario (0.5 hr.)**
- **Lec. 23: Data collection and analysis in NMT Planning (0.5 hr.)**
- **Lec. 24: Complementarity and Selection of Interventions (0.5 hr.)**
- **Lec. 25: Alternative Selection through Economic & Financial Analysis (0.5 hr.)**

Week 6:

Module 3: Non-Motorised Transportation (NMT) Planning
- **Lec. 26: Introduction to NMT systems (0.5 hr.)**
- **Lec. 27: Basic NMT Characteristics (0.5 hr.)**
- **Lec. 28: Pedestrian Data Collection and Flow Characteristics (0.5 hr.)**
- **Lec. 29: PTS Case Studies Pedestrian flow characteristics on facilities (0.5hr.)**
- **Lec. 30: Pedestrian Level of Service (PLOS) based on Flow models (0.5hr.)**

Week 7:

Module 3: Non-Motorised Transportation (NMT) Planning
- **Lec. 31: Other types of Pedestrian Level of Service (PLOS) (0.5 hr.)**
- **Lec. 32: HCM 2010 Methodology for PLOS (0.5 hr.)**

Lec. 33: HCM 2010 Methodology for PLOS (contd.) (0.5 hr.)
Lec. 34: Bicycle Facilities and Level of Service (BLOS) (0.5 hr.)
Lec. 35: BLOS and Bicycle Compatibility Index (BCI) (0.5 hr.)

Week 8:

Module 3: Non-Motorised Transportation (NMT) Planning
Lec. 36: NMT Design Principles (0.5 hr.)
Lec. 37: Design of Pedestrian Infrastructure (0.5 hr.)
Lec. 38: Design of Pedestrian Infrastructure (contd.) (0.5 hr.)
Lec. 39: Design of Cycling Infrastructure (0.5 hr.)
Lec. 40: Design of Cycling Infrastructure (contd.) (0.5 hr.)

Week 9:

Module 4: Urban Transport & Sustainability
Lec. 41: Travel Demand Management (TDM) overview (0.5 hr.)
Lec. 42: Push measures cases (0.5 hr.)
Lec. 43: Pull measure cases (0.5 hr.)
Lec. 44: Parking Studies (0.5 hr.)
Lec. 45: Transit Oriented Development (TOD) (0.5 hr.)

Week 10:

Module 4: Urban Transport & Sustainability
Lec. 46: Introduction to Intelligent Transportation Systems (ITS) (0.5 hr.)
Lec 47: ITS components, applications and communication (0.5 hr.)
Lec. 48: ITS Architecture (0.5 hr.)
Lec. 49: Electronic Toll Collection (ETC) (0.5 hr.)
Lec. 50: Public Bicycle Sharing (PBS) System with ITS (0.5 hr.)

Week 11:

Module 4: Urban Transport & Sustainability
Lec. 51: Multimodal transportation (MMT) environment (0.5 hr.)
Lec. 52: Multimodal Level of Service (MMLOS) (0.5 hr.)
Lec. 53: Multimodal Level of Service (MMLOS) (contd.) (0.5 hr.)
Lec. 54: Design of multimodal transfer facilities (0.5 hr.)
Lec. 55: Park & Ride (P&R) Facility Planning (0.5 hr.)

Week 12:

Module 4: Urban Transport & Sustainability
Lec. 56: An Introduction to Pedestrian Road Safety and associated Risk Factors (0.5 hr.)
Lec. 57: Road crash estimation and elements of predictive methods (0.5 hr.)
Lec. 58: Predicting Vehicle-Pedestrian and Vehicle-Bicycle conflicts (0.5 hr.)
Lec. 59: Environmental Concerns of Urban Transport (0.5 hr.)
Lec. 60: Sustainable strategies for Urban Transportation (0.5 hr.)

Books and references

1. Travel Demand Management and Road User Pricing: Success, Failure and Feasibility, edited by Gerd Sammer & Wafaa Saleh (2009), AshGate
2. The Implementation and Effectiveness of Transport Demand Management Measures -An International Perspective, edited by Stephen Ison, Tom Rye, (2008), Ashgate
3. Sustainable Transport: Planning for Walking and Cycling in Urban Environments, edited by Rodney Tolley (2003) Woodhead Publishing Ltd.
4. Fruin, J.J. Pedestrian Planning and Design, McGraw Hill Publication, 1987
5. Hudson, M. The Bicycle Planning, Open Books, 1982
6. Fundamentals of Intelligent Transportation Systems Planning, by Mashrur A. Chowdhury, Adel Wadid Sadek, (2003) Artech House, Inc. Boston
7. http://local.iteris.com/itsarch/index.htm
8. Perspectives on Intelligent Transportation Systems (ITS), by Joseph M. Sussman, (2008) MIT, Springer.
9. Ceder, A., 2016. Public Transit Planning and Operation: Modeling, Practice and Behavior, 2nd Ed., CRC Press
10. Traffic & Highway Engineering, Garber, N.J., and Hoel, L.A., 5 th Edition, Cengage Learning, 2015

Standards and Government Reports:

1. IRC 103:2012, Design of Pedestrian Facilities. Indian Road Congress
2. IRC 11: 2015 Design & Layout of Cycle Tracks. Indian Road Congress
3. Indo-Highway Capacity Manual (HCM), CSIR-CRRI, 2018.
4. TOD Guidance Document. Ministry of Housing and Urban Affairs, GoI
5. NMT Guidance Document. Ministry of Housing and Urban Affairs, GoI
6. PBS Guidance Document. Ministry of Housing and Urban Affairs, GoI