L 0  Introduction to Transportation System Engineering:

Module I. Traffic stream characteristics
L 1  Fundamental parameters of traffic flow: speed, density, volume, travel time, headway, spacing, time-space diagram
L 2  Fundamental relations of traffic flow: time mean speed, space mean speed and their relation, relation between speeds, flow, density, fundamental diagrams.
L 3  Traffic stream models: Greenshield’s model, Greenberg’s logarithmic model, Underwood’s exponential model, pipe’s generalized model, multi-regime models.
L 4  Moving observer method: Concepts and derivation, illustration, Calibration of Greenshild’s model.

Module II. Traffic measurement procedures
L 5  Measurement at a point: Traffic volume measurement, equipment for flow measurements, data analysis, concepts of ADT, AADT.
L 6  Measurement over a short section: Speed measurements, 15th and 85th percentile speeds, design speed, speed distributions.
L 7  Measurement along a length of road: Density measurement, travel time measurement.
L 8  Automated traffic measurement: GPS devices, loop detectors, video analysis, and other technologies. [S]

Module III. Microscopic traffic flow modeling
L 9  Car-following models: Concept of stimulus-response, general mottoes models, safety distance, psycho-physical, optimal velocity, fuzzy logic models, and applications
L 10 Lane changing models: Conceptual framework, lane selection model, gap acceptance models.
L 11 Vehicle arrival models: Poisson distribution, headway modeling, random vehicle generation.
L 12 Microscopic traffic simulation: Vehicle generation, design, calibration, validation, applications, operational models.

Module IV. Macroscopic and meso-scopic traffic flow modeling
L 14 Cell transmission models: Flow conservation, flow transmission.
L 15 Traffic progression models: Robertson progression model, platoon movement, dispersion index, applications.
L 16 Discrete simulation models: Cellular automata concepts, discretization of time and space, rules for acceleration, deceleration, randomization, and vehicle updating.

Module VI. Traffic intersection control
L 17 Principles of traffic control: Requirements, basic driving rules, priority movements, principles of traffic control, intersections conflicts.
L 18 Traffic signs and road markings: Regulatory, warning, and information signs; longitudinal, transverse, and object marking. [S]
L 19 Uncontrolled intersection: Level of service concept, priority streams, conflicting traffic, critical gap and follow-up time, capacity, queue length, control delay.
L 20 Channelization: channelizing devices, geometrical aspects, turning radius. [S]
L 21 Traffic rotary: Conflict resolution in a rotary, geometric layout, design elements, capacity of rotary.
L 22 Grade separated intersection: Road over bridges, under pass, overpass, trumpet interchange, diamond interchange, fully and partial clover leaf intersection. [S]

Module VI. Traffic signal design

L 23 Elements of traffic signal: Definitions, analysis of saturation headway, saturation flow, lost time, critical flows, derivation of cycle length.

L 24 Design principles of a traffic signal: Phase design, cycle time determination, green splitting, pedestrian phases, and performance measures.

L 25 Evaluation of a traffic signal: Definitions and measurement of stopped and control delay, Webster’s delay model, oversaturated conditions.

L 26 Capacity and Level of service LOS: Definitions, highway capacity, factors affecting LOS, HCM methods.

L 27 Capacity and Los analysis of a signalized I/S: HCM 2000 method of analysis of a signalized intersection and determination of the level of service.

L 28 Coordinated traffic signal: Concepts of offset, common cycle length bandwidth, offset for one-way and two way streets.

L 29 Vehicle actuated signals and Area traffic control: Basic principles of vehicle actuation, collection of data, system architecture and algorithms.

Module VIII. Traffic impact studies

L 30 Parking Studies: Parking inventory, statistics, parking surveys; in-out, license palate, on-street and off-street parking.

L 31 Congestion studies: Performance measures, intensity, duration, extent of congestion, traveler perception, remedial measures, congestion pricing.

L 32 Toll operation: Design and configuration, queuing characteristics, operation and maintenance issues.

Reference:


[S] => Self study
Traffic measurement procedures

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Module III. Microscopic traffic flow modeling

L 9 Car-following models: Concept of stimulus-response, general mottoes models