NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF CIVIL ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**M. Tech. (Transportation Engineering and Management)**		
Course Title	**TRAFFIC FLOW THEORY**		
Course Code	**CE611**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	None		
Session	**January 2021**	**Section (if, applicable)**	**N.A.**
Name of Faculty	**Dr. S. Moses Santhakumar**	**Department**	Civil Eng
Official Email	moses@nitt.edu	**Telephone No.**	**9842450011 (M) 3155 (O)**
Name of Course Coordinator(s) (if, applicable**)**	**N.A.**		
Official E-mail		**Telephone No.**	
Course Type (please tick appropriately**)**	☐ **Core course**	☐ **Elective course**	

Syllabus (approved in Senate)

Traffic stream parameters - Fundamental diagram of volume-speed-density surface. Discrete and continuous probability distributions. Merging manoeuvres - critical gaps and their distribution.

Macroscopic models - Heat flow and fluid flow analogies - Shock waves and bottleneck control approach.

Microscopic models - Application of queuing theory - regular, random and Erlang arrival and service time distributions - Queue discipline - Waiting time in single channel queues and extension to multiple channels.

Linear and non-linear car following models - Determination of car following variables - Vehicle trajectories - Acceleration noise.

Geographical Information System – Global Positioning System – Intelligent Transportation Systems - Area Traffic Control – Automatic Toll Collection – Smart Cards – Collision Detection System – Big data – collection and analysis.

Reference books:

1. Drew, D.R., *Traffic Flow Theory and Control*, McGraw Hill., 1978.
2. TRB, *Traffic Flow Theory* - A Monograph, SR165, 1975.
3. Burrough P.A. and Rachel A. McDonell, *Principles of Geographical Information Systems*, Oxford Publication, 2004.
4. Sussman, J. M., *Perspective on ITS*, Artech House Publishers, 2005.

COURSE OBJECTIVES

1. To be introduced to traffic flow theory
2. To study macroscopic models
3. To learn the fundamentals of queuing theory
4. To learn the fundamentals of ITS
5. To study the car following models

MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO)
1. Ability to analyze the traffic stream parameters	a b d
2. Skill to apply macroscopic models, especially fluid flow analogy	a b c e g i
3. Ability to apply the queuing theory	a b c e g i
4. Skill to analyze vehicle interactions	a b c e g i
5. Capability to define the significance of ITS under Indian conditions	a b c e g i j

COURSE PLAN – PART II

COURSE OVERVIEW

To understand the principles of traffic flow theory and apply macroscopic and microscopic models.

COURSE TEACHING AND LEARNING ACTIVITIES

Sl. No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week 1	• Syllabus and course content • Intelligent Transportation Systems • Geographical Information System principles • Global Positioning System principles	• PPT
2	Week 2	• Area Traffic Control • Automatic Toll Collection • Smart Cards	• PPT
3	Week 3	• Intelligent vehicle • Sensor technologies • Collision Detection System	• PPT
4	Week 4	• Applications in developed countries • Intelligent Vehicle – Highway Systems • Applications under Indian countries	• PPT
5	Week 5	• Traffic stream parameters • Flow, speed and density • Fundamental diagram of volume-speed-density surface	• Digipad
6	Week 6	• Variation of the stream parameters • Discrete probability distributions • Continuous probability distributions	• Digipad • Tutorials
7	Week 7	• Cycle Test I	

8	Week 8	• Merging manoeuvres • Critical gaps and lags • Probability distributions of gaps and lags	• Digipad
9	Week 9	• Macroscopic models • Fluid flow analogy • Heat flow analogy	• Digipad
10	Week 10	• Shock waves • Examples using u-k diagram • Bottleneck analysis	• Digipad • Tutorials
11	Week 11	• Microscopic models • Application of queuing theory • Queue definitions	• Digipad
12	Week 12	• Regular, random and Erlang arrival patterns • Service time distributions • Queue discipline and special cases	• Digipad
13	Week 13	• Cycle Test II	
14	Week 14	• Waiting time in single channel queues • Practical applications - Problems • Extension to multiple channels	• Digipad • Tutorials
15	Week 15	• Linear car following models • Stimulus – Response equation • Determination of car following variables	• Digipad
16	Week 16	• Tracking of vehicle pair • Time slice method • Practical applications - Problems	• Digipad • Tutorials
17	Week 17	• Traffic stability – local and asymptotic • Non-linear car following models • Acceleration noise	• Digipad

COURSE ASSESSMENT METHODS (shall range from 4 to 6**)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	Week 7	1 hour	20
2	Cycle Test 2	Week 13	1 hour	20
3	Assignment 1			10
4	Assignment 2			10
5	Seminar			10
CPA	Compensation Assessment*	Week 17	1 hour	20
6	Final Assessment *	Week 18	2 hours	30

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

It is proposed to take feedback from the students, at the end of the semester to evaluate the execution of the course.

COURSE POLICY (including compensation assessment to be specified**)**

MODE OF CORRESPONDENCE (email/ phone etc)

1. **Email on** moses@nitt.edu
2. **Phone on 9842450011 (M) or 3155 (O)**
3. **Whatsup on 9842450011**

COMPENSATION ASSESSMENT POLICY

Compensation Assessment will be administered (at the end of the course) to those students who had missed Cycle Test 1 or 2 for valid reasons. The portions for Compensation Assessment will be the combined portions for Cycle Tests 1 or 2.

The students who wish to appear for the Compensation Assessment should obtain prior permission from the HoD.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

Grading will be done with normalized score.

FOR APPROVAL

Course Faculty _____ **CC- Chairperson** _____ **HOD** _____

Head
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