TL 757 Intelligent Transportation Solutions
3 Credits
Spring 2018

Instructor and contact information

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Office Hours: By Appointment

Office contact via email

The instructor will be checking email during business hours. Responses will be within 2 business days. All assignments must be submitted via NDSU Blackboard. Microsoft Word and/or Excel workbooks are required for homework assignment uploads. Exams must be completed on line.

Bulletin description

Fundamentals and field studies of information technologies deployed and emerging to address critical transportation issues such as congestion, safety, security, and energy efficiency.

Course description

This three-credit online course in the Transportation and Logistics program introduces graduate students from various disciplinary backgrounds to transportation solutions that leverage technological advancements. Known as intelligent transportation solutions (ITS), a variety of information technologies help to move people and freight more safely, securely, and efficiently across the multimodal transportation network. Traditional technological approaches such as advanced traveler information and active traffic management are now part of a broader landscape that features deployments of connected, automated, and autonomous vehicle technologies with limitless possibilities. The effective utilization of existing and emerging technologies, however, requires interdisciplinary knowledge of the benefits, operating characteristics, deployment considerations, potential shortcomings, security-privacy concerns, and policy impacts. This course will teach operating fundamentals and study the potential impacts of deployments. Lessons will include reading assignment of research reports and analytical articles. This course features interactive online discussion forums that encourage collaborative peer exchange of knowledge and shared experiences, and learning through critical thinking to assess opportunities that are tailored to the regional context.

Course objectives

At the conclusion of this course, students will have gained:

- A conceptual understanding of the most common intelligent transportation solutions deployed, their anticipated benefits, and their shortcomings
- A basic understanding of how emerging technological developments would transform and benefit the multimodal transportation system in the near future
- Knowledge to evaluate policy impacts and plan for the practical deployment of technology solutions in the real-world, tailored to the regional context
- Insights into the vast potential of possible approaches to apply existing and emerging technologies in ways that would facilitate fruitful interactions between transportation supply, transportation demand, performance measures, planning, and policy making

Course prerequisites

None

Required student resources

All students must have access to a computer and internet connection because the instructor will provide guidance and knowledge resources online via NDSU Blackboard. The instructor will post lecture materials, forum instructions, and reading assignments weekly. Graduate students are expected to self-develop and hone their research and technical writing skills. Therefore, this graduate course will replace traditional mid-term and final exams with a research paper. Subsequently, students are encouraged to think about and develop a research topic within the first few weeks so that the literature reviews can be focused and submitted for midterm grading. Students may consult with the instructor via email or phone for help in selecting a topic of interest. After the course, students may optionally seek further collaboration to submit excellent papers to select journals for professional peer-review and possible publication.

Recommended Resources

The instructor will post online knowledge resources that complement each lesson.

Course schedule / calendar of events

The planned topics and schedule are as shown below:

Week	Topic
1	Introduction to Transportation and Overview of ITS. Definitions, Modes, Infrastructure, Congestion, Capacity, and Pavement Lifecycle. Overview of Smart Cities, Connected and Autonomous Vehicles.
2	Traveler information and advisory systems (such as dynamic signage, onboard equipment, smartphone applications)
3	Traffic flow control (including congestion mitigation, adaptive signaling, ramp metering, variable speed limits/warnings, transit priority, CCTV)
4	Technologies for managed facilities (such as HOV and other dedicated lanes). Automatic Identification and RFID (e.g. toll tags, transit cards, RFID, smartphones, license plate readers).
5	Pre-clearance systems (including vehicle classification, high-speed weigh-in-motion, roadside inspection, freight scanners)
6	Smart parking solutions (occupancy sensors, parking reservation systems, metering technologies, etc.)
7	Connected Vehicles: Technologies and the National ITS Architecture
8	Connected Vehicles: key applications (information, shared mobility, crash avoidance, driver assist, platooning, etc.) **Midterm** (instructor review of draft research paper)
9	Automated Vehicles and Vehicle electrification.
10	Cloud Computing (Advisory Systems: security threats, weather, work zones, incidents, detours, traffic; ITS Architecture Compatibility; Condition Monitoring and Asset Management Systems), and the Internet-of-Things (connected pipelines, railroads, etc.)
11	Big Data (travel time forecasting, maintenance decision-support, flow optimization, parking availability)
12	Remote Sensing (surveillance, satellites, UAS technology, emergency response, incident management) and Energy Harvesting Sensors
13	Cybersecurity, Privacy, and Policy Impacts of Technology Deployments
14	Future Technologies (NextGen Air, Autonomous Cargo Ships, Hyperloops, etc.)
15	Final paper grading (students conduct and submit peer-reviews of research paper)
16	The instructor reviews all papers and the grades received from peer reviews
17	**Final** Exam (the instructor grades paper peer reviews and provides feedback)

Evaluation procedures and criteria

The instructor's philosophy is that students learn best from each other, with guidance that structures and focuses the knowledge assimilation. Hence, the grading for this course will reflect the effectiveness of their online participation to share knowledge and insights, and to provide constructive peer-reviews for improvement. Graduate students must also self-direct their development of research and technical writing skills. As such, the points that make up the final course grade has three components as follows:

Online forum participation (original posts and peer-reviews)	50
Midterm (quality of research paper plan and literature review)	20
Final (Research paper reviews and peer-reviews)	30
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Total	100

The first component of a student's grade (online forum participation) includes a sub-component based on how others rate the quality of their posts (60% of the 50 points), and a sub-component based on the quality of the peer-reviews they provide to the posts by others (40% of the 50 points). Similarly for the third component of the grade (final), 60% of the 30 points account for the review results by their peers, and 40% of the 30 points account for the quality (constructiveness) of their peer reviews of the paper by others. The instructor will provide further instructions online regarding the required length, organization, and content for the original posts and the peer-reviews.

The letter grade that corresponds to the total of 100 points are as follows:

Numerical Score	Letter Grade
90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
Below 60	F

Time demand and expectations

This course is managed and delivered completely online. A traditional three-credit course meets three hours per week for sixteen weeks. In addition, graduate students are expected to spend two more hours outside of class for every hour in class per week. Equivalently, students are expected to spend a total of nine hours per week on this online class. It is mandatory that students check the NDSU Blackboard very frequently (daily recommended) for course updates and forum postings.

Attendance

NDSU Policy 333 on class attendance and procedure states that "attendance in classes is expected." In an online format, the forum serves a virtual classroom for peer-participation, and the NDSU Blackboard serves as a virtual blackboard to exchange information. Hence, class attendance in the online context is equivalent to meeting the requirements for timely forum participations and assignment submissions. Forum participation requires that each student post an original synthesis and insights from studying the weekly lectures and knowledge resources provided. Students must also post peer-reviews of submissions by others before the end of that week. Original posts are due by midnight each Wednesday. Peer-reviews are due by midnight each Sunday. Each forum topic closes at midnight each Sunday. Therefore, makeup postings are not allowed. Students are encouraged to begin their assignments early in the week because late assignments will not be accepted.

Americans with disabilities statement about students with special needs

"Any students with disabilities or other special needs, who need special accommodations in this course are invited to share these concerns or requests with the instructor and contact the Disability Services Office as soon as possible."

Approved academic honesty statement

"The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty."