

Yeditepe University Civil Engineering Department
CE 492 Engineering Project
Proposal Form

Supervisors Name/s	Dr. Öğr. Üyesi Murat Bayrak
Project Title	Microsimulation-Based Signal Optimization and Design of Actuated Control Scenarios for an Urban Corridor
Project Reference No*	
Relevant course/s for the project	CE 361, CE 473

Project Summary:

The objective of this project is to analyze and optimize traffic flow along a signalized corridor consisting of four intersections. Students will process raw video footage provided by the supervisor to extract traffic volume data (turning movements and vehicle classification) for morning and evening peak hours. Using this real-world data, a microsimulation model (e.g., AIMSUN, SUMO) will be developed. The project involves designing and testing various signal control scenarios, including actuated control with sensor logic. The final output will include a comparative report and technical drawings for sensor placement.

Project Achievements:

(Please explain how the proposed project helps to achieve the performance criteria listed below)

Identifying specific <u>design objectives</u> based on project requirements:	<ol style="list-style-type: none">1) Traffic flow efficiency will be evaluated under different scenarios. Objectives include minimizing average delay per vehicle and reducing the number of stops.2) The corridor will be analyzed under at least three scenarios: (1) Existing Pre-timed Control, (2) Optimized Green Wave Coordination, and (3) Fully/Semi-Actuated Control. These will be compared in terms of Level of Service (LOS) and total delay.3) Geometric design of the intersections and the placement of traffic control devices (sensors, signal heads) will be designed according to the operational requirements of the actuated control logic.
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Gathering and using relevant information	<ol style="list-style-type: none">1) Traffic volume data and turning movement counts will be extracted from camera recordings of the intersections. Peak hour factors (PHF) and vehicle composition will be determined from this footage.2) Geometric design and sensor placement will be compatible with KGM Traffic Signs Handbook and TS 13735.3) Microsimulation models will be calibrated using the observed field data (queue lengths and travel times observed in videos).
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<p>Analyzing alternatives using appropriate engineering knowledge</p>	<ol style="list-style-type: none"> 1) Different phasing diagrams and cycle lengths will be investigated to find the optimum solution. 2) Different sensor configurations (e.g., stop-bar detectors vs. advance detectors) will be tested to analyze their effect on intersection efficiency (green extension/gap out logic).
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<p>Considering the relevant constraints in the design: <i>(Please explain how the proposed project considers one or more limitations listed below)</i></p>	
<p>Economy</p> <p>Environmental Issues/Sustainability</p> <p>Manufacturability</p>	<ol style="list-style-type: none"> 1) The trade-off between the initial investment cost of smart sensors (radars/loops) and the economic benefits of reduced fuel consumption and travel time will be discussed. 2) Effects of signal optimization on vehicle emissions (CO₂, NO_x) due to idling and stop-and-go waves will be evaluated. 3) The feasibility of installing loop detectors (pavement cutting) versus video/radar detection will be discussed in the context of the technical drawings.

<p>Definition of outcomes linked to the objectives of projects</p>	<p>“Engineering Project” aims the students to gain the</p> <ol style="list-style-type: none"> 1) ability of usage their knowledge in mathematics, science and engineering, 2) ability to identify and solve complex engineering problems, 3) design experience, 4) ability to use modern tools and employ needed information technologies, 5) ability to conduct experiments if needed, gather data and analyze results, 6) routine of combining their individual creativity with teamwork, 7) oral and written presentation experiences in foreign language, 8) ability to access information and recognition of the need for following developments in science and technology, 9) awareness of professional and ethical responsibility, 10) information about business life practices like project management and risk management, 11) awareness of effects of their engineering practices on health, environment, and safety, 12) awareness of project award mechanisms and tendering procedures, 13) awareness of the interaction of designers and constructors. <p><i>(Minimum requirements are;</i></p> <ul style="list-style-type: none"> ○ <i>project timeline,</i> ○ <i>abstract,</i> ○ <i>Türkçe özet,</i> ○ <i>the definition of the problem,</i> ○ <i>the scientific information and literature review,</i> ○ <i>different design alternatives and decision criteria,</i> ○ <i>selection of optimum alternative</i> ○ <i>economical, sustainability, ethical issues</i> ○ <i>engineering drawing and demonstration methods while presenting the solution</i> ○ <i>appendix including standards, patents, brochures etc.)</i>
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Approval of the Project	Approved <input type="checkbox"/>	Not Approved <input type="checkbox"/>
State the reason(s) if not approved:		
Department Chair: Dr. Öğr. Üyesi Özgür Köylüoğlu	Signature	

** Project Ref.Numbers will be given by the Engineering Design Project Committee*