Aims
The Highway and Traffic Engineering option is designed to follow the whole process of planning, locating, designing, constructing and controlling highways. The first part of the course deals with the properties of traffic. The second part deals with process of designing and constructing a road. The third part deals with the monitoring and control of traffic once the road is built.

Subjects covered include the functions of different road types; ground models and their use in highway design; principles of route location; geometric link design; optimisation of horizontal and vertical alignments; calculation of earthworks quantities; design of pedestrian areas, cycleways and busways; principles of junction design; design of at-grade intersections, roundabouts and grade-separated intersections; design and construction of earth structures; pavement foundations; road materials; design of flexible and rigid pavements; maintenance of pavements; traffic variables and the Fundamental Diagram; shock waves; queuing processes; steady state and time-dependent delay formulae; methods of data collection; estimation of saturation flows; cycle time and green split calculation; cyclic flow profiles, TRANSYT and offset calculation; on-line signal control; pedestrians, cycles, buses and trams in signal control; motorway monitoring and control; theory of microscopic traffic simulation; use of VISSIM for design evaluation.

SYLLABUS
Introduction
Introduction to the highway planning process

Traffic Engineering
Traffic flow, speed and density – the Fundamental Diagram
Traffic flow theory and shock waves
Traffic flow data collection and analysis
Methods of speed measurement, moving observer surveys
Origin-destination surveys using registration numbers
Traffic flow forecasts
Accuracy of traffic data
Off-line calculation of traffic signal timings
On-line traffic signal control
Queueing processes
Delay formulae
Highway Design
- Determination of need for a highway
- Ground models and their use in highway design
- Principles of route location
- Geometric link design
- Optimisation of horizontal and vertical alignments
- Calculation of earthworks quantities
- Design of pedestrian areas, cycleways and busways

Junction Design
- Principles of junction design
- Signal control at isolated intersections
- Design of at-grade intersections
- Design of roundabouts
- Design of grade separated intersections

Geotechnical Aspects
- Site investigation for highways
- Design and construction of earth structures
- Pavement foundations

Highway Engineering
- Road materials
- Design of flexible pavements
- Design of rigid pavements
- Maintenance of pavements

Tutorials
- Analysis of traffic data
- Traffic signal calculations
- Use of VISSIM microscopic traffic simulation

Seminars
- Signal control in London – Ioannis Ioannidis, TfL
- SCOOT developments – David Bretherton, TRL
- Long-life assets – Professor Anthony Swain, UCL
- UTMC programme – Dr Ben Thancanamootoo, Mouchel

Coursework and submission dates
An essay on traffic engineering, week 11 (50% of coursework mark)
Geometric design calculations, week 21 (50% of coursework mark)

Assessment
One three hour written examination and two items of coursework.

Recommended Textbooks/Reading
Lecture notes supplied for each topic.
Department of Transport Design Manual for Roads and Bridges, obtained from www.officialdocuments.co.uk/document/ha/dmrb/index.htm

Learning Outcomes
- Understand the use of different road types in the highway network.
- Design a highway allowing for differing terrains, horizontal and vertical curves.
- Design suitable at-grade and grade-separated junctions.
- Understand the geotechnical aspects of road design.
- Understand the use of traffic signals.
- Calculation of traffic signal times.
- Understand the use of traffic simulation.
- Synthesis of disciplines.