Module Name: Introduction to IP Networks

Acronym: IPN

Module Manager: Dr Miguel Rio

Course Summary:
This Module provides an Introduction to IP networks and Data networks in general. It follows a bottom up approach, starting in layer 2 with coverage of Ethernet and IEEE 802.11. It then covers the essentials of IP protocols (IPv4 and IPv6) with a big emphasis on network routing, both intra and inter domain. Congestion and flow control is taught by detailing the TCP protocol and a smaller emphasis in UDP and newer congestion control protocols like RTCP and DCCP. Quality-of-service is examined in detail by looking at the fundamentals of queuing theory and the Integrated and Differentiated services architecture. The course finishes with analysis of upper layer functionality, namely session and application layer protocols and security. The course contains a lab session where the theoretical concepts are illustrated with small exercises.

Intended Learning Outcomes
On completion of this course, students should be able to:

- Know and understand the principles of MAC layer namely Ethernet and IEE 802.11.
- Understand the basis of packet switching and how this is achieved in the IP protocol
- Understand the difference between distance vector and link state protocols in the context of intra-domain routing and know the details of how OSPF (Open Shortest Path First) works
- Know how inter-domain routing works and the details of the BGP protocol
- Know the main business stake-holders in the Internet eco-system and the consequences to BGP policy
- Know the most important mechanisms to achieve quality of service in the Internet.
- Know how the DNS (Domain Name System) works and the impact on network performance.
- Choose the main security mechanisms for a specific threat
- Use the main network management UNIX tools

Course Content

- **Introduction**
  - Introduction and historical background
  - Ethernet and and Local Area Network
  - Wireless Network and IEEE 802.11

- **IP and Routing**
  - Introduction to the IP protocol (IPv4 and IPv6)
  - Intra-domain routing
  - Inter-domain routing

- **Congestion Control and Quality of Service**
  - The TCP protocol
  - The UDP protocol
Introduction to Quality of Service
- Integrated Services Architecture
- Differentiated Services Architecture

- The Upper Layers
  - Session Protocols
  - Application Layer Protocols
  - The Domain Name Service
  - Security

- Lab
  The course finishes with a lab session where commands like ping and traceroute illustrate the concepts in the lecture.
Assessment:
A two and half hour unseen written examination will be held under UCL MSc examination regulations at UCL.

Tutorials/Workshops:
A two hour tutorial will follow a week after the completion of the module.