Faculty of Engineering and Physical Sciences

A Continuing Education Course on

IP Networking Protocols and Technologies

10-14 November 2014

Enquiries to:

Continuing Education Office, Room 07 BB 01
Faculty of Engineering and Physical Sciences
University of Surrey, Guildford, Surrey, GU2 7XH
Tel: 44 (0)1483 686040 Fax: 44 (0)1483 686041
Email: B.Steel@surrey.ac.uk

Website: http://www.surrey.ac.uk/ee/pd
Course Overview

There has been a great advance in IP networking protocols and technologies in recent years. This course introduces and explains in some depth the principles, protocols, technologies, services and standards used for Internet networking.

On successful completion of the module the students will have been introduced to various networking principles and technologies, will have understood principles of internetworking, addressing and routing, will have been exposed to quality of service, will have been exposed to LAN, wireless LAN, IP router and ATM technologies, will have been exposed to relatively recent developments in IP (multicast, integrated and differentiated services, MPLS, IPv6, IP network security) and finally they will have been introduced to upper layer protocols, including TCP in detail, presentation aspects and various applications (mail, WWW, directory and name services, VoIP and multimedia services).

The Lecturers

Prof. Zhili Sun is a Professor of Communication Networking in CCSR at the University of Surrey. His main research interests include IP networking, High Speed LANs, Traffic engineering, QoS, future generation Internet and satellite networking. He teaches these subjects at both postgraduate and undergraduate levels, supervises PhD students. He has been project leader and principal investigator in European research projects as well as technical reviewer of national and international research projects.

Prof. George Pavlou is Professor of Communication Networks in the Department of Electronic Engineering at University College London while he has previously been Professor at the University of Surrey for 10 years. His research interests focus on network management, networking and service engineering, including aspects such as traffic engineering, quality of service management, autonomic networking, content-centric networking and communications middleware. He has been instrumental in a number of key European and UK research projects and has contributed to standardisation activities in ISO, ITU-T and IETF.

Dr. Haitham Cruickshank is a Senior Lecturer in CCSR at the University of Surrey. His main research interests include network security, optimisation of data networks, network architecture and satellite communications. He teaches these subjects at both postgraduate and undergraduate levels, supervises PhD students, and has been working in several European research projects.

Dr. Michael Howarth is a Lecturer in CCSR at the University of Surrey. His main research interests include internet protocols, QoS and traffic engineering. He teaches these subjects at both postgraduate and undergraduate levels and supervises PhD students; he also conducts research in a number of European research projects.

Dr. Ning Wang studied at Changchun University of Science and Technology in China, the Information Communication Institute of Singapore at Nanyang Technological University and subsequently completed his PhD in Electronic Engineering at the University of Surrey. His research interests include: Network virtualisation techniques; Internet Quality of Service QoS) provisioning; Intra/inter-domain traffic engineering and optimisation; Multicast communication; Overlay and peer-to-peer (P2P) networks; Autonomic network management.
Course Content

Syllabus

1. Introduction (ZS)
   - Circuit switching
   - Packet switching
   - Virtual connections
   - Datagrams
   - ISO/OSI reference model
   - ATM protocol reference model
   - Internet protocol architecture
   - Convergence of networks, services and user terminals

2. Link layer protocols (HC)
   - Framing
   - Error correction and detection
   - Follow and error control
   - HDLC
   - PPP

3. Local Area Networks and high speed LANs (ZS)
   - IEEE 802 standard LANs
   - Ethernet (IEEE 802.3)
   - Fast Ethernet and Gigabit Ethernet (IEEE 802.3u and IEEE 802.3z),
   - LLC sublayer

4. Wireless networks and LAN interconnection (ZS)
   - Wireless LAN (IEEE 802.11) and WiMax IEEE (802.16)
   - Bluetooth (IEEE 802.15)
   - Repeaters
   - Bridges: transparent and source routing
   - Interconnecting different LAN types

5. Internetworking (MH)
   - The Internet Protocol (IP)
   - Routers / Gateways
   - IP addressing
   - Address Resolution Protocol (ARP)
   - IP datagrams
   - IPv6
6. Routing (MH)
- Routing strategies, the "best" route
- Distance Vector (RIP)
- Link State (OSPF, IS-to-IS) Routing Protocols

7. Broadband networks and ATM (ZS)
- Introduction to ATM and B-ISDN
- Reference model for B-ISDN
- Traffic sources and characteristics
- ATM service categories
- Traffic control and management

8. IP and ATM internetworking (ZS)
- Classical IP over ATM
- LAN Emulation

9. Network security (HC)
- Security requirement and attacks
- Encryption techniques
- Authentications
- Public key encryption
- Digital signature
- Firewall
- IPv4 and IPv6 security

10. Transport Layer protocols (GP)
- Model and services
- TCP in detail
- UDP
- RTP/RTCP
- Sockets and Transport API

11. Application Layer Protocols (HC)
- DNS
- Telnet
- FTP
- SMTP
- WWW
12. VoIP (HC)
- Voice over IP protocols
- H.323
- SIP
- Mbone applications

13. Web technologies (ZS)
- WWW protocols and operation
- Static web pages
- Dynamic web pages
- Active web pages
- JAVA applets
- Search engines
- Web Services

14. Network Management (NW)
- MIB structuring and technologies
- Network management principles
- Simple Network Management Protocol (SNMP)

15. Network Management (NW)
- Network monitoring
- Internet traffic requirements
- Router functionality
- Queuing and scheduling disciplines

16. Internet Quality of Service (QoS) (ZS)
- Traffic engineering
- Differentiated services
- Integrated services
- Multi-Protocol Label Switching (MPLS)

17. Multicast (MH)
- Concepts and model
- Multicast routing
- Data forwarding
18. The Future (ZS)

- Network technologies and services
- Convergence of network technologies and services
- Future Internet requirements
- Economics of the Internet
- Evolution of the Internet from IPv4 to IPv6
- Next generation Internet

**Recommended Reading**

(This book is essential if you are studying for the Modular MSc)

Additional Reading
## IP Networking Protocols and Technologies
### Provisional Timetable
#### 10-14 November 2014

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00-10:30</td>
<td>1. Introduction</td>
<td>5. Internetworking</td>
<td>9. Transport layer and protocols</td>
<td>13. Internet QoS</td>
<td>17. Applications &amp; VoIP I</td>
</tr>
<tr>
<td></td>
<td>Prof Z Sun</td>
<td>Dr M Howarth</td>
<td>Prof G Pavlou</td>
<td>Prof Z Sun</td>
<td>Dr H Cruickshank</td>
</tr>
<tr>
<td>10:30-11:00</td>
<td>COFFEE</td>
<td>COFFEE</td>
<td>COFFEE</td>
<td>COFFEE</td>
<td>COFFEE</td>
</tr>
<tr>
<td></td>
<td>Prof Z Sun</td>
<td>Dr M Howarth</td>
<td>Prof G Pavlou</td>
<td>Dr M Howarth</td>
<td>Dr H Cruickshank</td>
</tr>
<tr>
<td>12:30-13:30</td>
<td>LUNCH</td>
<td>LUNCH</td>
<td>LUNCH</td>
<td>LUNCH</td>
<td>LUNCH</td>
</tr>
<tr>
<td></td>
<td>Prof Z Sun</td>
<td>Dr M Howarth</td>
<td>Dr H Cruickshank</td>
<td>Prof Z Sun</td>
<td>Prof Z Sun</td>
</tr>
<tr>
<td>15:00-15:30</td>
<td>TEA</td>
<td>TEA</td>
<td>TEA</td>
<td>TEA</td>
<td>TEA</td>
</tr>
<tr>
<td></td>
<td>Dr H Cruickshank</td>
<td>Prof Z Sun</td>
<td>Dr H Cruickshank</td>
<td>Dr Ning Wang</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Dinner at the Rum Wong</td>
<td></td>
<td>18:45 approx</td>
</tr>
</tbody>
</table>

Please note that this syllabus is provisional and we reserve the right to change it. All registered delegates will be notified of any major change before the course date.

*Updated 2 April 2014*
Accommodation

Unfortunately on-site accommodation is not available on this course. Details of accommodation in the local area can be found on our website.

Cost

Price per person, including lunch, refreshments and printed course notes

Price per person, including lunch, refreshments and printed course notes:

- £1650 - Early bird rate for registration received by 10 October 2014
- For IET Members (proof of membership needed)
  - £1575 - Early bird rate for payment received by 10 October 2014
- For Registrations received after 10 October 2014
  - £1750

Terms and Conditions

Delegates can make a provisional registration for a course by telephone or email. However bookings are only acknowledged formally once payment has been received.

Cancellations notified in writing ten working days before the event

We charge a cancellation fee of 35% of the standard rate. If we have already received payment we refund 65% of the full fee.

Cancellations within 10 working days before the event

We charge these at the full rate and do not give refunds.

Substitutions

You can make substitutions at any time before the event.

Cancellation by the University

We reserve the right to cancel any course because of insufficient numbers or for other reasons beyond our control.

Proof of payment

Registrations must come with a valid purchase order, credit card payment or cheque.
Take the Credit – the Modular Masters Programme

By reading for a Masters degree on a flexible part-time basis delegates are able to continue with their working careers and still gain a universally recognised qualification. Satellite Communications can also form part of the “MSc in Electronic Engineering” via Short Courses. The purpose of the programme is to encourage those working in industry to continue with their professional development without necessitating an expensive career break. The modular approach means that students can choose their own pace of study, to fit in with their work commitments.

An attendee can elect to undertake assessment for this course should he or she so wish. These assessments are mainly by examination with some written course work by assignment, and, occasionally some laboratory work.

15 credits towards the MSc in Electronic Engineering can be awarded once the student has successfully completed the examinations and assignments associated with this course.

The Modules

Courses currently participating in the Modular Masters Programme are listed below.

- Antennas and Propagation
- Digital Signal Processing
- IP Networking Protocols and Technologies
- Microwave Engineering
- Mobile Communications
- RF Circuit and System Design (double module course)
- Satellite Communications
- Spacecraft Systems Design

A full explanation of how the short course MSc works is given on our website.

http://www.surrey.ac.uk/ee/study/pd/modular_msc/
## Conditions of Booking

Application forms should be completed and returned to the address below and must be accompanied with the correct payment. Attendance at the event will only be confirmed on receipt of the full payment.

Cancellations notified in writing ten working days before the event; we charge a cancellation fee of 35% of the standard rate. If we have already received payment we refund 65% of the full fee. Cancellations within 10 working days before the event; We charge these at the full rate and do not give refunds.

If no written notice of cancellation is received, no refund can be made. The University of Surrey reserves the right to cancel any event. In this case, the full fee will be refunded unless a mutually convenient transfer can be arranged. Details of event changes or cancellations are available by phoning +44 (0)1483 686040

Name Substitutions may be accepted following consultation with Barbara Steel, Continuing Education Manager
Tel: +44 (0) 1483 686040
Email: b.steel@surrey.ac.uk

Delegates with Special Needs The University aims to offer fully accessible events to all of its delegates. Please help us to accommodate any individual needs that you may have by attaching a note to the registration form. We will contact you to discuss this as necessary.

Data Protection Information provided by you on this form will be processed by the University of Surrey and used for the purpose of the goods and services ordered by you, and for billing accounts.

The University of Surrey is not, as a body responsible for the views or opinions expressed by individual authors or speakers.

Complete and return this form to:
Barbara Steel
Faculty of Engineering and Physical Sciences
University of Surrey
Room 03 BB 04
Guildford
Surrey
GU2 7XH
Fax: +44 (0) 1483 686041

For all enquiries telephone +44 (0) 1483 686040 or email b.steel@surrey.ac.uk

University of Surrey VAT reg No:
GB 688 953 065
CE Website: www.surrey.ac.uk/ee/pd

## REGISTRATION (Please complete in CAPITALS)

<table>
<thead>
<tr>
<th>Family Name ___________________________________</th>
<th>Title: (Mr, Mrs, Miss etc) ___________</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name ____________________________</td>
<td>Job Title ________________________________</td>
</tr>
<tr>
<td>Name of Organisation (for name badge) _____________________________________________________________________</td>
<td></td>
</tr>
<tr>
<td>Address for Correspondence _____________________________________________________</td>
<td></td>
</tr>
<tr>
<td>Town/City _____________________________________________________________________</td>
<td>Postcode ___________________________</td>
</tr>
<tr>
<td>Contact Telephone ___________________________</td>
<td>Fax ______________________________</td>
</tr>
<tr>
<td>Email _________________________________________________________________________</td>
<td></td>
</tr>
<tr>
<td>Do you have any dietary or other requirements? _______________________________________</td>
<td></td>
</tr>
<tr>
<td>Previous Experience</td>
<td></td>
</tr>
<tr>
<td>Beginner □</td>
<td>Intermediate □</td>
</tr>
<tr>
<td>Approved By (please print): ______________________________________________________</td>
<td></td>
</tr>
<tr>
<td>Position in Company: ____________________________________________________________</td>
<td></td>
</tr>
<tr>
<td>Signature: _____________________________________________  Date: __________________</td>
<td></td>
</tr>
</tbody>
</table>

## FEES AND CHARGES (Please complete the appropriate box)

Fees include attendance at the sessions, a hard copy of the course notes, morning and afternoon refreshments, lunch each day. Please note that we do not charge VAT.

Charge per person

**EARLY BIRD REGISTRATION RATE** for registrations received before 10 October 2014

<table>
<thead>
<tr>
<th>IET Member</th>
<th>£1575.00</th>
<th>Non Member</th>
<th>£1650.00</th>
</tr>
</thead>
</table>

**STANDARD REGISTRATION RATE** for registrations received 10 October 2014

<table>
<thead>
<tr>
<th>Non Member</th>
<th>£1750.00</th>
</tr>
</thead>
</table>

IET Membership Number (if applicable) _____________________________________________

## PAYMENT DETAILS

Payment must accompany this registration from. Registration will only be confirmed on receipt of full payment.

Please indicate the method of payment:

- [ ] Cheque
- [ ] Credit Card
- [ ] Purchase Order
- [ ] Bank transfer
- [ ] Cheques should be made payable to “University of Surrey” and crossed

Credit card: Visa □ Mastercard □ Switch

If paying by credit card please telephone the office on 01483 686040. We will need card number, 3-digit security code, name of person on card and address. A receipt will be issued for the credit card payment.