Middlesex University London

CCM 4300

Computer Networks: Wireless and Mobile Communication Systems

Module Handbook

Autumn term – September start (24 week module)

2012/13

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School of Science and Technology

Information in alternative formats

This handbook can be found online at: *http://unihub.mdx.ac.uk*

If you have a disability which makes navigating the website difficult and you would like to receive information in an alternative format, please contact:

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We can supply sections from this publication as:

- a Word document with enlarged type — sent by email or supplied on a CD or memory stick
- printed copy with enlarged type
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Disclaimer
The material in this handbook is as accurate as possible at the date of production however you will be informed of any major changes in a timely manner.

Other Documents
Your module handbook should be read and used alongside your programme handbook and the information available to all students on UniHub including the Academic Regulations and Student Charter

Contents

Module Summary/Introduction

Introduction

Computer network technology enables a vast range of significant activity: business competitiveness, national security, personal communications to name but a few. This module will establish an understanding of the operation, capabilities, security issues affecting network and Internet communications, business use of computer networks and the various ways in which these factors interact with each other.

On successful completion of this module, you will come to appreciate the operation of a variety of types of current networks and a single framework will be used to analyse, design and construct networks capable of providing the right connectivity and performance needed by specific applications.

In particular, you will understand the principal technical aspects of underlying computer networks and mobile systems, their capabilities, security threats to networks and a range of countermeasures that can be taken to mitigate these.

You will be able to analyse and evaluate specific networks for a range of applications and are provided the opportunity for developing commercially viable network applications.

The module teaching team

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Contacting the Module Leader

You can contact your module leader in the following ways:

Office Hours: please check duty rota or by appointment - Room No: T115

Email s.rahman@mdx.ac.uk
Telephone 020 8411 6860
https://myunihub.mdx.ac.uk

It is not necessary to book an appointment to see me (S Rahman) during the above office hours you just need to drop by.

In the first instance problems should be dealt with by talking to your lecturer after the lecture. Queries concerning course content are particularly suitable for the MyUniHub Discussion Board (https://myunihub.mdx.ac.uk).

UniHelp

On the Hendon campus, UniHelp is located on the Ground Floor of the Sheppard Library

Office Hours: Monday to Friday: 08.30 – 21.30

Saturday and Sunday: 11.00 – 18.00

KIS Teaching and Learning Data

The following figure shows as a percentage the proportion of time a student on this module will spend in each of the following:

- *Scheduled teaching 24%*
- *Independent study 76%*

Module Aims

This module aims to provide an understanding of the technology underlying network operation for network types ranging from small, local-area networks to the Internet with its global coverage. This establishes the technical background needed to appreciate the capabilities of computer networks, to manage networks, and to evaluate networks intended to meet specific enterprise requirements. Having established how networks are capable of providing connectivity can be established on any scale, the module then proceeds to cover the linking of such networks and their management as well as security concerns.

This readily accessible and managed fabric has the capability to support many applications, and, what is more, to support different applications at the same time. The reasons for this versatility and flexibility are considered, and the ways in which they may be realized are examined. It is shown that the applications can be grouped under the broad headings of communication, digital libraries, and the market place. The specific examples considered under the respective heading include electronic mail and Electronic Data Interchange, the World-Wide Web, and various aspects of electronic commerce and Internet commerce.

Learning Outcomes

Knowledge

1. Study the distinct concepts and protocols in one part of the wired/wireless network architectures and learn how they all fit together.
2. Exhibit ways in which the technology of computer networks affects the suitability for particular applications
3. Display a knowledge of implications of the specific mode of operation of a network and their security measures and counter measures

Skills

4. Formulate the requirements for a computer network intended to support a specific application.
5. Discuss and critically analyse security measures in place for networked systems such as identification and authentication schemes, cryptography, firewalls and intrusion detection systems.
6. Investigate potentially innovative-networked applications and harness networking concepts to provide innovative solutions as well as analysing security risks and present suitable recommendations.

Assessment Scheme

- For local study centre Students, theoretical content will be delivered during the weekly lectures. The module will be taught by a series of lectures, seminar sessions and self study (1 hour lecture per week + 2 hours)
- For Students studying at overseas franchise partners, Lectures and Learning material will be used to impart theoretical content (1 hour per week)
- For all students, weekly seminars and laboratory sessions will be used to extend the theoretical material using group and practical exercises (2 hours of seminar biweekly, 2 hours of lab biweekly)

Assessment Weighting

- Unseen examination (60%) (learning outcomes 1-5)
- Coursework (40%) (learning outcomes 4-6)
    - Group presentations (15%)
    - Individual report (15%)
    - Laboratories (10%)

Note: To pass a taught module, coursework (incl. laboratory work) and examination components must be passed individually.

Syllabus

- Principles of computer networks: definitions, concepts and components of computer networks, network topologies, LANs, WANs, MANs, protocols, high-speed LANs, broadband multiservice networks.
- Reference model, Client/server architecture, Access Control algorithms, network components - repeaters, hubs, bridges, switches and routers, routing algorithms.
- Wireless Networks (WLANs, WWANs, WPANs, Mobile IP, AdHoc Networks, Bluetooth Wireless Technologies, Wireless carriers and service providers.

- Wireless access technologies, GSM, GPRS, UMTS, EDGE, 4G, Sattellite.
- Networked applications and services.
- The operation of various networking technologies, including local-area networks, packet-switched networks, wide-area networks, frame relay, ATM and the Internet, data and voice, VoIP.
- Multimedia Networking, communication network, digital library, market place, email, socket programming and DNS.
- Network Security, concepts and definitions, computer security goals and vulnerabilities, taxonomy of classifying risks and threats, Authentication, legal and ethical issues in computer security, security attacks, network security, security protocols, Steganography, Secure Electronic Transactions (SET).
- Network management, infrastructure, SNMP.

Reading Materials

- Core Texts

- James F. Kurose and J. Rose, Computer Networks: A Top-Down Approach Featuring the Internet, 6th Edition, ADDISON WESLEY, ISBN: 0132856204.
- Jochen Schiller, Mobile Communications, Pearson Education, ISBN: 0-321-12381-6.
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- Additional Texts

- R. R. Panko, Business Data Networks and Telecommunications: Pearson Education, ISBN: 0-13-221441-5
- Geoffrey Elliott and Nigel Phillips, Mobile Commerce and Wireless Computing Systems, ADDISON WESLEY, ISBN 0-0321-26358-8
- William Stallings, Wireless Communications & Networks, 2nd Edition, Pearson, ISBN-10: 0-13-191835-4
- William Stallings, Data and Computer Communications, 9th Edition, Pearson, ISBN 10: 0-13-139205-0.
- Behrouz A Forouzan, Data Communications and Networking, 4th Edition, McGraw-Hill, ISBN-10: 0-07-325032-5
- Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th Edition, Pearson, ISBN 10: 0-13-212695-8

Book Purchase Suggestions

Books can be purchased from stores like Waterstones, Foyles or online like Amazon.

Study hours outside class contact

The study hours for each credit point is 10 hours. For a 30-credit module this equates to 300 hours. Therefore, if a module has time-tabled activities, i.e. lecture/seminar/lab, of 3 hours per week for a 24 week period (total of 72 hours), then the out-of-class study commitment expected of students is 228 hours in total.

Brief Guide to Web-based Module Material

Lecturer note details can also be found on OasisPlus, the university's online learning environment. This can be accessed from the following url: https://myunihub.mdx.ac.uk. We emphasise that lecture notes provide useful information but other readings such as books and digital libraries are suggested to successfully complete the module.

Coursework

Details of Coursework

CW1 - Group presentation assignment

CW1 involves a group presentation assignment. In real life engineers and computer scientists work in small groups (4 to 10 persons), where individual tasks are assigned to group members either by senior managers or group/project leaders through decisions, ability and preferences. However, it is quite often that you find opposition from other groups who think otherwise. So it is rather important that you should be prepared to vigorously defend what you are presenting. The topics for the group project can be chosen from any of the following topics as shown below. ***Please note that the research topics must be based on research work published in IEEE (or equivalent) journal paper.***

- **Distributed computing**
- **Various high-speed computer network technologies**
- **Wireless access methods**
- **Wireless LAN technologies**
- **Wireless WAN technologies**
- **Network management**
- **Network Security**
- **Video Coding**
- **Modulation, Coding, Compression and other relevant techniques**
- **VOIP and other relevant applications**

More specific research areas for the CWs are given at the end (p.17).

A group project will give students the experience of working with other colleagues who they may or may not have something in common. The main objective of such an exercise is for the group members to realise their own qualities and shortcomings and to show group dynamic and professionalism. This type of presentations will help each individual member realise the following:

- The importance of feeling and being an active and a valued member of a group
- Being able to proportion and receive praise and blame
- Ability to identify important tasks and to have fruitful discussion with group members
- Ability to research a given topic and bring in important information to the group
- Ability to observe and assess group members and give positive/constructive feedback
- Ability to allocate responsibility through civilised discussions
- Ability to represent your group in the official presentation sessions
- Ability to assess other presenting groups in a constructive and balanced way

Group Formation Form and Organizing the presentations

CCM4300: Computer Networks, Wireless and Mobile Communication Systems

Seminar Day and Time: _____
Group name: _____
Group Leader: _____
Group Leader Email: _____

	Members Names	Student number	Email	Telephone number (mobile)
1 **L**				
2 **D**				
3				
4				
5				

Note: Under no circumstances that you are allowed to have more than FIVE members per group including the group leader and/or less than 3 per group. (

*L – leader, D – deputy/assistant leader

Assessment criterion – CW1

Group presentation

Group presentation will contribute for 15% of the module overall grade. The main objective is developing group dynamics, team-work, interactive skills, debating and presentation skills. Note that all group members MUST participate in the presentation as well as the discussion.

Each group will present its findings for 15-20 minutes (the timing can be changed by the seminar tutor according to the total number of students).

Late submissions will be decremented by 5% for every day the work is overdue to the maximum of 25% of the overall marks. Late submissions with valid extenuating circumstances must be notified to the students' office prior to the deadline for submission of coursework.

Marking scheme for group presentations and dialogue
Group Number: _____
Seminar Session: _____
Date:_____ Title: _____
Final mark: _____ Tutor Initials: _____

Element	Max. Mark in %	Comments	Mark awarded
Clarity to present topic	**10%**		
Relevance to the topic	**10%**		
Organisation of Material	**10%**		
Evidence of Team work	**20%**		
Speaking Coherence/Quality	**10%**		
Discussion	**30%**		
Time keeping	**5%**		
Report	**5%**		
TOTAL	**100%**		

CW2 - Journal paper and individual presentation

The main objective of this journal paper will be to investigate and critically review one of the latest research issue published in **IEEE (or equivalent) journal paper**. The topics for the individual journal paper can be chosen from any of the following topics as shown below.

Learning outcome:

- To give students an insight computer communication systems using existing infrastructure.
- To allow students to learn how to perform an extensive survey of the literature using scientific publications.
- To allow the students to learn how to critically evaluate existing approaches.

Aim of the assignment:

To investigate and analyse the way in which new, state of the art computing and communication technologies, and various approaches are used to solve problems in one of the following areas **(must be based on research work published in IEEE *(or equivalent) journal paper)***:

- **Distributed computing**
- **Various high-speed computer network technologies**
- **Wireless access methods**
- **Wireless LAN technologies**
- **Wireless WAN technologies**
- **Network management**
- **Network Security**
- **Video Coding**
- **Modulation, Coding, Compression and other relevant techniques**
- **VOIP and other relevant applications**

Tasks:

You have to write a Journal paper on the problems faced when dealing with one of the areas given above. You have to investigate and look into the following aspects.

- Provide literature survey about the architecture of the technologies used in these areas.
- Specify problems faced by using scientific publications (especially published material such as conference and journal papers).
- To discuss the implications of these problems on the underlying infrastructure and/or applications using these technologies.
- To discuss the required changes and various solution approaches for the problems specified. At least investigate **two alternative** solution approaches in details.
- Critically **evaluate** the provided solution approaches.
- Provide **evidence** of critical thinking in the discussion.
- Address the questions arising from current literature and in this way further knowledge of the area studied.
- The report should demonstrate **all** necessary qualities in terms of writing skills, format, and contents as specified above.
- The journal papers, should consider existing design, and development problems in computer networks (can be within the context of design, quality of service, performance, security, mobility etc.), provide alternative solutions from the literature, and critically analyse the proposed solution approaches.

Your Journal paper of **maximum of 6 PAGES** (must be strictly followed) should explore and critically analyse the problems and be able to evaluate the proposed solutions.

Notes

- Additional research work outside of that covered in class will be required for the successful completion of this assignment.
- Ensure to provide reference illustrations taken from scientific publications, journals, books and the world wide web.
- Be sure to include a reference section in your report indicating any sources of information used.
- The submission should be in your own words with the exception of quotations from other sources that should be highlighted in quotation marks "…" and referenced.

Additional information for the formal report

Research or development is effectively useless if it is not communicated to other people. Many mediums for this communication exist, e.g. books, scientific papers, reports, television, lectures etc. Each medium is appropriate to the material it is to be used to impart. A formal report is often used to communicate laboratory work. To ensure that such reports achieve their aim, it is necessary to adopt a common format for that report. This document describes a common format and explains some ramifications and thoughts that lie behind the choice of that format.

Overview

Communication of scientific work often takes a similar format, whatever the chosen medium is. This format can be summarised as:

- summary or abstract;
- introduction;

- theory;
- procedure;
- results;
- discussion and further work;
- conclusions;
- references and appendices

Outline of the formal report
It is advised that a formal report follows closely this format.

Abstract
The abstract should be a brief summary of the contents of the report. This is the part which is mostly used to understand the subject area and the nature of the report and great care should be taken when it is written.

Introduction
The introduction should briefly place work in its appropriate context and gently "lead in" to the subject of the report. It should describe other, closely related, work in the field - using reference where necessary - hence placing the work in its historical and technical context.

Theory
The major theory required by a reader to understand the work should be described. It may sometimes be necessary to omit this section or place its content in appendices.

Procedure
A description of the experimental procedure should cover techniques, equipment and components used, and their limitations (where appropriate).

Results
Results should be presented, highlighting important features, so as to draw the reader's attention to the success of the work. Much use should be made of graphs, waveforms and tables, if applicable. The results of a scientific work are always difficult to assess. In preparing for this, you as the author should ask yourself: Does it achieve its objectives? Is it a clear report? Have there been any mistakes? etc.

Discussion (and further work)
The results of the work should be discussed and explained, compared with theory to validate results. It is sometimes impossible to distinguish between results and their perusal, and it may be advantageous to combine these sections.

Conclusions
The conclusions should briefly underline major results and their relevance and importance.

References and Appendices
Any references cited should be placed in a list after the conclusion. Appendices should contain material not directly relevant to the main body of the report, i.e. specifications of components.

Note: The above structure obviously will not suit all reports. Sometimes it may be necessary to omit some sections, sometimes to include others. The sections you should never omit are the abstract, the introduction, the discussion and the conclusions.

Paper format: Please visit the link http://www.ieee.org/publications_standards/publications/authors/authors_journals.html for guidelines on how to write a journal paper. This format is the IEEE one. It will also be provided in oasis.

Poster and individual presentation assignment for CW2

Learning outcome:

- To present the knowledge gained with a journal.

Each student should summarise his/her Journal in a Poster and give a presentation of 5-10 minutes about it. Journal paper, posters and individual presentations in combination count as 15% of the total marks.

Assessment criterion – CW2

Journal paper and poster presentation

Your Journal paper will be marked on **accept/reject** bases, if rejected, a maximum mark of 40%will be awarded regardless of the quality of the paper or the poster presentation. Journal paper and poster together contribute 15% of the module overall grade. More specifically, your Journal paper contributes 50% and the poster will carry another 50%. Please see marking scheme below for more details.

Late submissions will be decremented by 5% for every day the paper is overdue to the maximum of 25% of the overall marks. Late submissions with valid extenuating circumstances must be notified to the students' office prior to the deadline for submission of coursework.

Marking scheme for journal paper

You will be marked according to the following rationale:

- **Structure** of the paper (15%)
  - Clear definition of the abstract, aims and objectives of the paper
  - Selection of material
  - Organisation and ordering of material
- **Presentation** (20%)
  - Precise and effective communication
  - Clarity of writing, exposition and use of references
- **Initiative** (20%)
  - Originality
  - Independent thinking and individual expression
  - Critical writing (as opposed to routine copying)
  - Independent use of library and external resources
- **Understanding** (45%)
  - Theoretical/Technical concepts
  - Merits/demerits
  - Critical analysis
  - Applications
  - Conclusion

Marking scheme for poster presentation

Student Name: _____
Seminar Session: _____
Date:_____ Title:_____
Final mark:_____ Tutor Initials:_____

Element	Max. Mark in %	Comments	Mark awarded
Organisation of Material (poster)	**20%**		
Littirature review (poster)	**20%**		
Critical analysis and discussions (poster)	**20%**		
Oral presentation (poster presentation)	**40%**		
TOTAL	**100%**		

Specific research areas/topics for both the CWs.

1. Green Communication-Energy Efficient Mobile Network
2. Cognitive Radio-Efficient Spectrum Usage
3. Wireless Gigabit - Ultra High Data Rate Communication
4. Multi-hop MIMO communications
5. A Wake-Up Radio for Wireless Sensor Networks
6. Link layer protocols for ultrasonic, short-range, underwater communication
7. Implementation of a low-power wireless network node for use in environmental monitoring
8. Cellular communications with MIMO Relay
9. Bi-directional cooperative MIMO systems
10. Cooperative interference detection technique for Cognitive Radio
11. Cooperative MIMO and relay techniques for future communication systems
12. Channel estimation techniques for WiMax networks
13. Multiuser detection receivers for UMTS networks
14. ON-OFF keying OFDM systems in frequency selective channels
15. A hardware design and implementation of a Binary Frequency Shift Keying (BFSK) modulator-demodulator
16. Frequency Assignments in Wireless LANs with Partially Overlapped Channels
17. Performance Analysis of Ad-hoc Wireless Networks based on OFDMA
18. Advanced mobile network self-management techniques for the optimization of network performance and quality of service
19. Mobile Terminal Positioning Techniques
20. Mesh generation for FD-FDTD
21. TeraHertz sources for Space and Security applications
22. Broadband Small Signal Microwave Amplifier Design
23. Microwave Local Positioning System
24. MMIC ultra low noise amplifiers
25. Wideband LNA for Nanosats Downlink
26. Direct-Digital RF Modulator Based on CMOS Technology for Cognitive Radio Transceiver
27. Spectrum Sensing Techniques in Cognitive Radio Network
28. L – S Band Tunable Filter Design and Realization
29. Microwave Transceivers and Their Application in Multi-channel Propagation Characterisation
30. Electromagnetic Tomography
31. Wireless control of real time digital signal processing systems
32. Modelling of Speech for Enhancement Purposes
33. Detection of Technical Problems during Video Capture
34. Automatic Detection of Identical Content from Different Angles
35. High Frame Rate Television
36. Processing of TDOA Data to Determine Position in a Wireless Sensor Network
37. CSTA Architecture and PBX Architecture
38. Open-Platform DSP Card Driver
39. Speech Compression/Decompression Techniques/Algorithms
40. Face Identification in Multimedia Archives
41. Detection and tracking of arbitrary objects in videos
42. Cloud on chip
43. Wireless measurement of respiration during speech
44. Detecting Errors in Distributed Databases
45. A Mobile Information System for Disease Control
46. SAMSON: Strong Multi-Agent Simulation of Wireless Sensor Networks
47. Image Processing Techniques for Automating Malaria Diagnosis
48. Distributed Visual Tracking of Multiple Mobile Robots
49. Adaptation of Controllers for Image-Based homing
50. Eye-Tracking Techniques to Investigate the Segmentation of Moving Images
51. Architecture-based Threat Analysis
52. Compression algorithms to digital image classification
53. Wireless systems for sensor networks
54. Monitoring and tracking hospital patients using Bluetooth and wireless LAN
55. Mobile IP: ICMP/Agent discovery process construction
56. GSM-R Telecommunications System for Railways

Labs and seminars

Guidelines for group formation and sheets for working through seminars/lab will be discussed in class and further information can be found on OASISplus. You would be expected to carry out activities related to theoretical knowledge gained in the lecture class in each seminar and lab session. Each lab will have several components and the components will be assessed during each lab session. These components will include the following: tasks on program, tasks on applications using Wireshark, and tasks on configuring access points.

YOU MUST SUBMIT THE LAB REPORT TO YOUR TUTOR AT THE END OF EACH LAB SESSION.

Deadline for Submission of Coursework

The deadline for all the coursework submission is shown here.

Finalizing the topics for the group work: Week 3/4

Group presentation: Week 11/12

Finalizing the topics for the individual work: Week 14/15

Poster presentation: Week 21/22.

Journal paper due date: Week 23.

Where to submit

For local students

Written assessed coursework must be submitted to UniHelp, Ground Floor, Sheppard Library. You should attach a coursework feedback form which will be dated and receipted. You should keep your receipt - it is for your own protection.

Do not hand written assessed coursework directly to your tutor, and do not submit it by email to your tutor.

Written work should normally be handed in on the campus at which the module is being taught; if for any reason you have to hand it in at another campus please point this out to UniHelp so that it can be sent to the correct campus. If, in an emergency, you have to send in written assessed work by post you must send it by recorded delivery to UniHelp, Sheppard Library, Middlesex University, The Burroughs, London NW4 4BT and keep the Post Office receipt. It will be deemed to have been submitted on the date of the postmark.

Receipts for this work and other work submitted outside opening hours can be collected from UniHelp.

Group Coursework
When submitting group coursework please ensure all students contributing to the coursework are clearly identified on the coursework Feedback Form.

Electronic Receipt of Coursework

Coursework may NOT be submitted in electronic form except where this is an explicit requirement of that assessment in the module in question. When electronic submission is a requirement, it must be done via MyUniHub never via email.

For overseas students

Please submit it to the relevant office in your campus but the above rules must be followed.

Electronic Receipt of Coursework

Coursework must be submitted to the student office. A copy of the coursework must also be submitted electronically. A link for the electronic submission will be provided in OASIS plus.

Intellectual Property

In most cases, students hold the intellectual property rights in the work they produce for assessment. There are some exceptions such as where the work is commercially-sponsored, or the aim of the module is to develop intellectual property, or where the student is sponsored or employed, or on placement. Students are asked to read the Middlesex University Policy Statement 'Intellectual Property Rights': **https://myunihub.mdx.ac.uk**

Feedback to students on coursework

You will be given feedback on coursework in any one of the following ways:

- Generic School Coursework Feedback form – attach the form with your coursework.
- Comments will be written inside the coursework itself.
- One to one feedback where appropriate.

Marking criteria have been shown under individual course work outline.

Coursework return

Coursework is not normally returned to students, so you should keep a copy of what you submit.

Teaching Plan

Seminar/Lab sessions in week no:	*Lecture sessions in week no: (1 hour)*	*Lecture Title*	*Content of lecture*
No labs or seminars in the first week	**1**	**Introduction**	**Network concept, types of networks, internet concept, etc.**
Seminar 1 (2 hrs) **Title: Introduction to CWs, Network/Internet concept**	**2**	**Network types**	**Circuit switched, packet switched, LAN/MAN/WAN/PAN/HAN/CAN etc.**
Lab 1- (2 hrs) **Title: Introduction – Wireshark, Router Configurations 1**	**3**	**Topologies**	**Various topologies, Reference model, Client/Server architecture, etc.**
Seminar 2 (2hrs) title: Network types, Client/Server paradigm, Reference model	**4**	**Physical layer and Access control 1**	**Analog/Digital Signal, Bandwidth, Data rate, Baud, Transmission Medium, Data Link Layer: LLC and MAC, Framing, Error Control, MAC- CSMA/CSMA/CD, and Token Passing.**
Lab 2 (2 hrs) **Title: Router Configurations 2**	**5**	**Access Control 2 and Interconnection Devices**	**Pure ALOHA, Slotted ALOHA, Multiplexing – FDMA/TDMA/CDMA, OSI Ref Model/Internetworking, Repeaters/HUBs, Bridges/Switches, Routers.**
Seminar 3 (2 hrs) **Title: Error checking/Contention protocols**	**6**	**Routing Algorithms**	**Routing Protocols – Distance Vector/Link State routing protocols, Dijkstra's Algorithm, and Hierarchical Routing.**
Lab 3- (2 hrs) **Title: Client/Server communication (Java implementation)**	**7**	**Internet**	**Virtual Circuits/Datagram, IPv4 Address, IP Datagram format, IP Fragmentation/Reassembly, TCP segment structure, TCP connection management, TCP characteristics, UDP, UDP Checksum.**
Seminar 4 (2 hrs) **Title: Multiple Access Control/ Interconnection devices**	**8**	**Internet mail system**	**Introduction to Email, Internet mail system –user agent, mail server, SMTP, SMTP operations, Mail Message format, MIME, POP 3/IMAP, Secure email and DNS.**
Lab 4- (2 hrs) **Title: Introduction – OPNET1**	**9**	**Network Security**	**Network security, Security Mechanisms, Security Threats, Cryptography, Authentication, Firewalls and IDS.**
Seminar 5 (2 hrs) **Title: Email/Routing algorithms**	**10**	**Multimedia Networking**	**Introduction, Audio and Video Compression, Streaming Audio and Video, and Best Effort Service.**
Lab 5- (2 hrs) **Title: OPNET2**	**11**	**WWW**	**Introduction, application layer, client-server paradigm, process communication, web page, types of web pages, HTML, HTTP protocol and example, and TCP – three way handshake.**
Seminar 6 (2 hrs) **Title: Security**	**12**	**HTTP**	**Non-persistent/persistent, message format, response time, methods – post, url, get, authentication, cookies, WEB caching, CDN, and HTTP performance modelling.**
Lab 6- (2 hrs) **Title: Wireshark–UDP 1**	**13**	**Wireless Network 1**	**Introduction, key concepts, connectivity, technologies, transmission, RF behaviour, modulation, media access techniques, log formula, and DS-SS.**
Seminar 7 (2 hrs) **Title: Witreless issues**	**14**	**Wireless Network 2**	**Introduction to FHSS, slow and fast FHSS, wireless LAN, cell based network, MAC in WLAN, MAC schemes/methods – centralised/distributed/all MAC methods, Hidden and Exposed problem, Near and Far Terminal, and MACA and DFWMAC.**

Lab 7- (2 hrs) **Title: Wireshark–UDP 2**	**15**	**GSM/GPRS/UMTS**	**Introduction and concept, architecture, network areas, specifications, network structure, cell types, handoff, power management, security, Introduction to GPRS, structure, EDGE, Introduction to UMTS and architecture.**
Seminar 8 (2 hrs) **Title: Spread Spectrum and GSM/GPRS**	**16**	**4G/Sattellite/Bluetooth**	**Roadmap and introduction to 4G, Satellite systems, GEO, LEO, MEO, HEO, Routing, Localisation, Handover, Introduction to Bluetooth, characteristics, architectures, concepts, link types, communication, piconet, error correction, power saving modes, interface, protocols, and architecture, security, and networking.**
Lab 8- (2 hrs) **Title: Wireshark – TCP 1**	**17**	**Communication system 1**	**Signals and types, Fourier series, Noise, Definitions- Spectral Density, PSD, white Noise, AWGN, SNR, Channel Capacity, Bandwidth and Digital Communication System.**
Seminar 9 (2 hrs) **Title: GPRS/Blueetooth/Satellite**	**18**	**Communication system 2**	**PCM, Line Coding and types, PAM, Bandpass Modulation, PSK, FSK, G-MSK, and OFDM.**
Lab 9- (2 hrs) **Title: Wireshark – TCP 2**	**19**	**Mobile IP 1**	**Introduction, requirements, terminology, network, routing, data transfer, concept, encapsulation, registration, handoffs, TCP behaviour, Network integration, optimization, Reverse tunneling, Triangular Routing, and Routing optimization.**
Seminar 10 (2 hrs) **Title: Encoding/Modulation/Management issues**	**20**	**Mobile IP 2/IPv6**	**Principles, overview, issues, handover, problems, security/architecture, authentication header, ESP, Key Distribution, micro-mobility, CIP-security/other issues, HAWAII, HMIPv6 and other issues.**
Lab 10- (2 hrs) **Title: Wireless 1 – BSS mode**	**21**	**Ad Hoc networks**	**Introduction, connectivity, MANET, Routing-examples, Reactive, DSR, Discovering and maintaining a path, and AODV.**
Seminar 11 (2 hrs) **Title: Mobile IP, and other wireless issues**	**22**	**IP Telephony**	**IP Telephony- circuit/packet switching, VOIP concept, signalling protocols, H.323, SIP, MGCP/ MEGACO, RTP/RTCP, VOIP example, Integrated Telephony, Mobile IP Telephony, Video over IP, and IP TV.**
Lab 11- (2 hrs) **Title: Wireless 2 – Extended and AdHoc mode**	**23**	**Network Management**	**Introduction, FCAPS, infrastructure, standards, SNMP overview – key parts, MIB, OID, Request-Response message, MIB example, Naming, OID tree example, protocol, message types, and security.**
	24	***Revision***	***Revision***

Useful Information

The School has a student website https://myunihub.mdx.ac.uk dedicated to enrolled Science and Technology students, which provides information to support you on your programme of study, including information on the School's Academic staff and:

- UniHelp opening hours
- Module Review Forms
- Learning Resources: Science and Technology
- Programme Handbooks

And other useful information such as

- Library Catalogue

MyUniHub

Lecturers' contact details can also be found on MyUniHub, the university's online learning environment. This can be accessed from the following url: https://myunihub.mdx.ac.uk Within each module you can find 'module information' which displays contact details for the lecturer and other information about the module.

Attendance Requirements

You should attend all scheduled classes. If you do not do so, you may not be able to demonstrate that you have achieved the Learning Outcomes for the module, and you are at risk of being graded "X" in the module. The definition of the X grade is: "Fail – incomplete without good reason: may not be reassessed." As a general guide, you need to attend at least 75% of scheduled classes in order to be able to demonstrate achievement of all Learning Outcomes. On some modules, there may be more specific attendance requirements.

Academic Dishonesty

Taking unfair advantage in assessment is considered a serious offence by the university, which will take action against any student who contravenes the regulation through negligence, foolishness or deliberate intent.

Academic dishonesty is a corrosive force in the academic life of the university; it jeopardises the quality of education and devalues the degrees and awards of the University.

The full regulations on academic dishonesty are given in the University Regulations, Section F Infringement of assessment regulations - academic misconduct.

Plagiarism

Plagiarism is one specific form of cheating.

The University Regulation Section F clearly sets out the University's understanding of plagiarism and the regulations by which you as a student of the University are bound. The key University regulation is F2.3 which defines plagiarism as "The presentation by the student as their own work of a body of material (written, visual or oral) which is wholly or partially the work of another, either in concept or expression, or which is a direct copy."

Work presented for assessment must be the candidate's own, or the work of a project group as requested by the tutor. Plagiarism is the representation of another person's published or unpublished work as the candidate's own by unacknowledged quotation. It is not an offence if the material is acknowledged by the candidate as the work of another through the accurate use of quotation marks and the provision of detailed references and a full bibliography, although the Assessment Board will not expect work to rely heavily on direct quotations.

In addition, the University Regulations set out the process for investigating allegations of plagiarism and describes the penalties. If you are found guilty, the repercussions are very serious indeed.

You should take steps, therefore, to understand what plagiarism is, how it can be identified and how you can avoid committing it; perhaps most importantly, you should reflect and come to understand why it is to your enormous advantage never to plagiarise because it is in effect cheating yourself and your fellow students).

Full details on the Infringement of assessment regulations - Academic misconduct, can be found in the University Regulations - Section F.

Appeals

The full regulations on appeals are given in the University Regulations. Section G - Appeal regulations and procedures

Examples of all Typical/Previous Examination Papers

Please go to the University student portal website https://myunihub.mdx.ac.uk for copies of previous examination papers in all subject areas across the University.