UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie / Lefapha la Boetšenere, Tikologo ya Kago le Theknolotši ya Tshedimošo

Study Guide

Department of Computer Science

Computer Networks
COS332

Lecturer: Prof Martin S Olivier
Last Revision: 2022.0.999i (25 Feb 2022)

Contents

COS332, 2022 and Covid-19

At the start of 2022 it seems that the worst of the pandemic is over, and we certainly hope that this is indeed the case. However, the pandemic itself is not over yet, and we still have to adhere to the regulations that are in place to protect us and, more generally, look after our own health and safety.

Remember that one of the major lessons from the pandemic is that anything can change at any time. Please keep this in mind when you read the study guide, including the information below.

In this spirit, COS332 will be presented as follows in 2022:

1. Lectures
   (a) Lectures will be presented using pre-recorded videos.
   (b) An online Blackboard discussion session will occur every Monday during the normal lecture slot, starting on 21 February 2022. The purpose of this session is to allow students to ask questions about the previous week's work, as well as to serve as a synchronous communication channel about the module.
   (c) A contact session will occur on Wednesdays during the lecture slot. The purpose will, again, be to allow students to ask questions about the work. The Wednesday sessions will also be used to re-establish a sense of community. The number of students who attend Wednesday sessions will be limited by the venue capacity according to Government regulations and common sense. Initially a reservation system will be used, but the manner in which the number of attendees will be controlled is likely to change during the semester. Detail will be provided via the ClickUP announcement facility. (At the time of writing this, the venue is restricted to 35 occupants.)
2. Practical sessions
   (a) You will complete practical assignments whenever and wherever you prefer. They have to be uploaded by the due date and then demonstrated at an arranged time in the Informatorium.
   (b) If the room in the Informatorium reaches capacity, remaining students will simply wait outside, until a demonstration has completed, after which more students will be allowed to enter.
   (c) If conditions change, these demonstrations may be changed to an online format using Google Meet.
3. Tests and examinations
   (a) Tests and examinations will be written on campus using a normal pen and paper.
   (b) However, if conditions change to a situation that does not allow this, online assessment will be used.
4. Consultations and assistance
   (a) I will be available for consultations in my office (IT 4-36) as indicated on the schedule at `https://mo.co.za/consult`. During these sessions students are more than welcome to visit me in my office to discuss any aspects of the module.
   (b) Note that the number of people in my office is limited by Covid protocols. However, based on pre-pandemic experience, I do not expect this to be a significant hurdle.
   (c) Students who are waiting for a consultation to conclude, should preferably wait in the foyer (rather than in the corridor). However, it would make sense to peek into my office prior to waiting, so that I know a next consultation is waiting.
   (d) Consultation slots are also a good time to phone me (012-420-2052) to make an appointment to visit me at another time (physically or virtually), or to ask a question (which I will gladly discuss telephonically, if I am not busy with a consultation).

(e) If conditions call for it, the consultation sessions will be moved to an online platform. Such online consultations will mimic the physical sessions described above. Details will be provided when and if necessary.

1 Introduction

1.1 Welcome

The objective of this module is to acquaint the student with the terminology of communication systems and to establish a thorough understanding of exactly how data is transferred in such communication networks, as well as of applications that can be found in such environments. The study material includes concepts and terminology, the hierarchy of protocols according to the OSI and TCP/IP models, protocols on the data level, physical level and network level as well as higher level protocols. The practical component of the module involves programming TCP/IP sockets using a high level language.

1.2 Educational approach

The course is heavily based on the ISO OSI model; with the primary emphasis on the higher layers — in particular, layers 7, 4 and 3. The intention is to spend at least one week (two lectures) on each layer, and two to three weeks (four to six periods) on each of these (for the purposes of the course) more important layers. In addition, a week or two (two to four periods) are devoted to topics that span the entire protocol stack. These include the overview of networking and security.

Some topics are covered in practical assignments only. These topics will form part of the material assessed during tests and examination.

Day	Time	Venue
Mondays	12:30 – 13:20	Blackboard Collaborate (online)
Wednesdays	14:30 – 15:20	IT 2-26

The primary mode of lecture presentation will be via video. As a rule of thumb, you will be expected to watch two videos per week prior to the discussion session on a Monday. The exceptions are

Note that the videos fit into three categories:, the 'preface' videos, the ISO OSI videos and the videos about the network layers. In the latter category, you will watch the videos starting from layer 6, and working your way down to layer 1. For each category (or layer subcategory) the introduction of every video will indicate that it is video m of n. This should assist you to ensure that you do not miss a video.

Note that the videos from previous years are available on the Youtube channel. Videos will be reused, and updates communicated during the Monday discussion sessions. You are welcome to watch at a faster pace than the prescribed pace.

Practical assignments have to be completed and uploaded to the CS site by the due date. You will then demonstrate the assignment later during one of the following sessions:

Day	Time	Venue
Tuesdays	15:30–18:20	Purple & Green Labs
Fridays	7:30–10:20	Blue Labs 1–3

Note that the day(s) that will be used for practical demonstrations are beyond our control. Also note that you do not have to be present for the entire session, but simply at an appropriate time to demonstrate your work.

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1.3 Schedule

Details of the schedule will be published on clickUP.

We will *more or less* follow the following lecture schedule:

- Week 1 Welcome, ISO OSI, other standards, socket programming
- Week 2 Application layer
- Week 3 Application layer (continued)

- Week 4 Presentation and session layers
- Week 5 Transport layer
- Week 6 Transport layer (continued)
- Week 7 Routing
- Week 8 Network layer
- Week 9 Network layer (continued)
- Week 10 Data link layer
- Week 11 Data encoding
- Week 12 Physical layer
- Week 13 Revision
- Week 14 Revision, start of examinations

1.4 Statement of Anti-Discrimination

The University of Pretoria is committed to building an inclusive, affirming and transformed institutional culture, curriculum and campus life. It rejects and condemns racism, sexism, homophobia, transphobia, xenophobia, ethnic chauvinism, religious intolerance, unfair discrimination, hate speech, sexual harassment, gender-based violence and retaliation, and all other forms of discrimination. The University has committed itself to the eradication of these practices, and in 2019 adopted an Anti-Discrimination Policy, in order to realise procedural and substantive equality in all respects.

As the lecturer and presenter of this module, I acknowledge the extreme harm that racism, sexism, xenophobia and other forms of discrimination have inflicted and continue to inflict on our society and communities. I commit to ensuring that there is an open dialogue between myself and all the students in the module on curriculum content and teaching method which may be interpreted as discriminatory or exclusive. I undertake to ensure that any such concerns are raised without fear of intimidation or recrimination. Moreover, I resolve to continuously improve the teaching of this course in a way that allows the inclusion of all the students enrolled for this course, building their self-confidence and self-efficacy, and supporting the ultimate goal of substantive equality for all persons.

The choices that we make about curriculum content and pedagogy (what and how we teach) are also choices about what kind of society we wish to build. In this declaration of intent, I resolve to be part of and give substance to the University?s anti-discrimination and transformation endeavours.

2 Administrative information

2.1 Contact details

2.1.1 Lecturer / Course coordinator

Prof Martin S Olivier — tel 012-420-2052
Consultation hours: See `https://mo.co.za/consult`

Note that students may also email the class representative, who will bring any important / urgent matters to the lecturer's attention. (The class representative will be appointed early in the semester.)

2.1.2 Teaching assistants

Teaching assistants are only appointed to mark assignment demonstrations. During such a session they may be able to answer questions, as long as nobody else is waiting to demonstrate. Contact the lecturer with any queries at other times. (See section 2.2.)

2.2 Interaction with the instructor

Under normal circumstances the lecturer maintains consultation hours, during which students are welcome to come and discuss any aspects of the course without appointment (See section 2.1.1). Students are also welcome to make an appointment (in person or by telephone) to discuss work at other times. (The consultation period is normally also a good time to reach the lecturer by telephone — at other times he may be hiding somewhere to get some work done.) The deluge of email has unfortunately rendered email an ineffective tool for this purpose, and time often does not permit this lecturer to reply to email.

Your Faculty Student Advisor can advise you on goal-setting, adjustment to university life, time management, study methods, stress management and career exploration. Book an individual consultation or attend a workshop. For other support services see Section 5.3.

2.3 Study material and purchases

2.3.1 Prescribed

The primary prescribed text is available on `https://netw.co.za`.

You are also expected to study the material provided on `http://www.networkmuseum.net`.

2.3.2 Additional references

Various RFCs will have to be consulted for practical assignments. They are identified in the individual practical assignments.

RFCs are available from `https://www.rfc-editor.org/`.

2.4 Grievance procedures

All issues should be reported in writing, providing details of the complaint or issue. First consult the lecturer concerned about the complaint or issue. If the matter is, however, not resolved, you should consult the class representative (the primary function of the class representative is to serve as a two-way communication channel between the class and the lecturer.) If the matter remains unresolved you should consult the module co-ordinator in the case of large module classes with multiple lecturers. Where the co-ordinator is unable to or fails to resolve the matter, you should consult the Head of Department. Should the matter remain unresolved, you may approach the Dean of the Faculty.

3 Module information

3.1 Purpose of the module

A brief description of the value and importance of the module within the context of the programme and/or profession as a whole (where relevant) is provided here. The description should be closely linked to the description in the yearbook.

3.2 Module outcomes

The primary outcome is the ability to comprehend the notion of a *network*. In order to do this, the manner is which network technologies are categorised in layers is of fundamental importance. Linked

to this is the need to comprehend how peer components communicate with one another via the lower layers of the protocol stack. Only once insight into this structure is gained is it possible to make sense of the myriad of technologies that play a role in data communications.

On a secondary level the student should become acquainted with the specific protocols (with TCP, IP, Ethernet and a variety of application protocols as the most prominent examples). The student should be able to demonstrate the use of some of these protocols in a practical context.

3.3 Articulation with other modules in the programme

Prerequisites: COS 216

3.4 Module structure

The following ABET study units are covered in the course:

- Net-centric Computing
  - Introduction to net-centric computing
  - Communication and networking
  - Network security
  - The web as an example of client-server computing
  - Building web applications
  - Network management
  - Wireless and mobile computing
- Social and Professional Issues
  - Social context of computing
  - Computer crime
- Algorithms and Complexity
  - Algorithmic strategies
  - Fundamental computing algorithms
  - Distributed algorithms
  - Cryptographic algorithms
- Architecture and Organisation
  - Interfacing and communication
  - Architecture for networks and distributed systems
- Information Management
  - Hypertext and hypermedia

3.5 Learning presumed to be in place

What set of attributes (knowledge, skills and attitudes) should students have in place on entering this module?

4 Assessment

4.1 Assessment plan

Note that assessment dates (in particular examination dates) are subject to change by the University. Double check the examination date at the start of the examinations.

Assessment	Date	Time	Venue
Semester test 1	Thursday, 17 March 2022	17:30 – 20:30	TBA
Semester test 2	Thursday, 19 May 2022	17:30 – 20:30	TBA
Examination	**Preliminary date** Wednesday, 22 June 2022	8:00 – 11:00	TBA

Note that the time and venues depend on the lockdown situation at the time of the scheduled test or examination. Tests and/or examinations may be written online, rather than in the venues indicated. The duration may also be adjusted depending on whether the test or examination is written on campus or online. More information will be provided closer to the scheduled times.

- Semester test 1: 30%
- Semester test 2: 40%
- Practical assignments: 30%

4.2 Assessment policy

The semester mark and examination mark will carry equal weights when the final mark is calculated. A final mark of 50% is required to pass. Note that a subminimum of 40% is required during the semester to be allowed to write the examination. A subminimum of 40% in the examination is required to pass.

4.3 Plagiarism

Plagiarism is a serious form of academic misconduct. It involves both appropriating someone else?s work and passing it off as one?s own work afterwards. Thus, you commit plagiarism when you present someone else's written or creative work (words, images, ideas, opinions, discoveries, artwork, music, recordings, computer-generated work, etc.) as your own. Only hand in your own original work. Indicate precisely and accurately when you have used information provided by someone else. Referencing must be done in accordance with a recognised system. Indicate whether you have downloaded information from the Internet. For more details, visit the library's website: `http://www.library.up.ac.za/plagiarism/index.htm`.

5 Support services

Please download a QR code reader on your cellphone. To download a QR code reader open your mobile app store (App Store, Google Play or Windows Marketplace) and search for QR code readers.

5.1 Safety in the evening and emergencies

- For any safety or emergency related matters, eg if you need a security officer to accompany you from your residence to campus, phone the Operational Management Centre (details at the back of your student card).
- The 24-hour, multi-disciplinary UP Crisis Line offers professional and confidential support to victims of crime in times of trauma. For assistance and immediate action, phone the UP Crisis Line on: 0800 00 64 28.

- Hatfield residence students: From 18:00 till 06:00 security officers are available to escort you (on foot) to and from your residence or campus anywhere east of the Hatfield Campus through to the Hillcrest Campus.

5.2 E-learning support

- Report a problem you experience to the Student Help Desk on your campus.
- Visit the open labs in the Informatorium Building or IT labs on your campus to report problems at the offices of the Student Help Desk.
- Approach the assistants at the help desks?campus specific (for example: adjacent to the Student Computer Laboratories in IT Building, NW2, CBT or Aldoel Building IT labs, etc).
- Call 012 420 3837.
- Email studenthelp@up.ac.za

5.3 Other support services

FLY@UP: The Finish Line is Yours	• Think carefully before dropping modules (after the closing date for amendments or cancellation of modules). • Make responsible choices with your time and work consistently. • Aim for a good semester mark. Don?t rely on the examination to pass.	www.up.ac.za/fly@up email: fly@up.ac.za	
Disability Unit	Academic support for students with learning disabilities: • Assistive technological services • Facilitation of test and examination accommodations • Test and exam concession applications • Accessible study venues and a computer lab • Referrals for recommended textbooks in electronic format	https://www.up.ac.za/disability-unit email: du@up.ac.za	
Student Counselling Unit	Provides counselling and therapeutic support to students	012 420 2333	
Student Health Services	Promotes and assists students with health and wellness	012 420 5233 012 420 3423	
The Careers Office	Provides support for UP students and graduates as they prepare for their careers	careerservices@up.ac.za 012 420 2315	
Department of Security Services	24-hour Operational Management Centre 24-hour Operational Manager Crisis Line	012 420-2310 012 420-2760 083 654 0476 0800 006 428	
Department of Student Affairs	Enquiries concerning studies, accommodation, food, funds, social activities and personal problems	012 420 2371/4001 Roosmaryn Building, Hatfield campus	
Centre for Sexualities, AIDS and Gender	Identifies and provides training of student peer counsellors	012 420 4391	
Fees and funding	http://www.up.ac.za/enquiry www.up.ac.za/fees-and-funding	012 420 3111	
IT Helpdesk	For student IT related queries	012 420 3051 studenthelp@up.ac.za	