



Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2018-2019

Course Handout Part II

Date: 07-01-2019

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : IS F462
Course Title : Network Programming
Instructor-in-Charge : Dr. Paresh Saxena (psaxena@hyderabad.bits-pilani.ac.in)

Scope of the Course:

This course is designed for the students to learn both basic and advanced network programming concepts. The course aims to teach the students most popular internet protocols that are being used while different machines are communicating. The course will introduce students to the development of several network protocols including UDP, TCP, HTTP, SMTP, Telnet, SSH, FTP, etc. The course will be using Python programming language to teach most of the protocols. We will also look for some recent industry trends and discuss some innovative ideas that have recently been developed. By the end of this course, the students will develop the understanding of networking from the perspective of a system/application programmer who is developing a system or an application that requires network-connected services.

Objectives of the Course:

- To gain an understanding of how different machines communicate with each other.
- To understand the network protocols and their use in real-world applications.
- To get familiarity on using the network sockets with Python programming language.
- To understand the client-server architectures and applications.
- To gain hands-on experience with the protocols for interacting with remote systems.

Textbooks:

[T1] W. Richard Stevens, *UNIX Network Programming, The Sockets Networking API*, Pearson Education, Vol. I., 3rd edition.

[T2] W. Richard Stevens, *UNIX Network Programming, Inter-process Communication*, Vol. II, Pearson Education, Vol. II., 2nd edition.

Reference books:

[R1] B. Rhodes and J. Goerzen, *Foundations of Python Network Programming*, Apress, 3rd edition.



Course Plan:

| S.. No. | No. of Lectures | Learning objectives | Topics to be covered | Chapter in the Text Book |
|---------|-----------------|---|--|---|
| 1 | 1 | - To understand the course components and structure. | Basic introduction to the course, explanation of exams and evaluations, description of semester project. | Class Notes |
| 2 | 1 | - To understand the basic Python concepts required for the course. | Basic Python Concepts for Network Programming | Class Notes |
| 3 | 2 | - To understand the basics of User Datagram Protocol (UDP). | UDP sockets, UDP Client and Server, Unreliability, Backoff, Blocking and Timeouts, UDP bindings, UDP fragmentations | T1: Chapter 2, R1: Chapter 2, Class notes. |
| 4 | 4 | - To understand the basics of Transmission Control Protocol (TCP). | TCP sockets, TCP Client and Server, TCP bindings, Deadlock, Closed and Half-Open connections, TCP algorithms | T1: Chapters 4,5, R1: Chapter 3, Class notes. |
| 5 | 2 | - To understand IP systems, Socket Names and DNS. | Hostnames and Sockets, IPv4 and IPv6, address resolution, DNS protocol | T1: Chapter 11, R1: Chapter 4, Class notes. |
| 6 | 3 | - To get familiar with the components of Network Data and Network Errors. | Bytes and Strings, Framing, Compressions, Network Exceptions. | R1: Chapter 5, Class notes. |
| 7 | 3 | - To understand the Transport Layer Security (TLS) and Secure Sockets Layer (SSL) protocols. | Hashing, Establishing Client/Server Connection over SSL | R1: Chapter 6, Class notes. |
| 8 | 4 | - To understand the Client/Server Architecture and applications. | Single-Threaded Server, Multithreaded Server, Synchronous and Asynchronous servers, Hashing and Sharding, Message Queues. | T1: Chapter 26,30 R1: Chapter 7-8, Class notes. |
| 9 | 6 | - To get familiarity with HTTP protocol and applications of working with web. | Status Codes, Caching and Validation, Content Encoding, Negotiation and Type, HTTP Authentication, Cookies, HTTP Servers, Hypermedia and URLs, Parsing and Building URLs, Hypertext Markup Language, Web application framework, Web sockets and scraping | R1: Chapters 9, 10 and 11, Class notes. |
| 10 | 2 | - To learn Email messaging formats. | HTML and Multimedia in Email, Adding content, Parsing E-Mail, Header Encoding and Parsing Dates. | R1: Chapter 12, Class notes. |
| 11 | 6 | - To understand different protocols for the interaction with remote systems (Part 1): Simple Mail Transport Protocol (SMTP), Post Office Protocol (POP) and | SMTP protocol, introduction to SMTP libraries, error handling, secured SMTP, POP server, connection and authentication, IMAP clients and messages. | R1: Chapters 13-15, Class notes. |



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| | | Internet Message Access Protocol (IMAP) | | |
| 12 | 4 | - To understand different protocols for the interaction with remote systems (Part II): Telnet, SSH and File Transfer Protocol (FTP) | Overview of SSH, SSH host keys, SSH Authentication, File Transfer over SSH, Downloading and Uploading using FTP, Error Handling, Directory Scanning, Secure FTP | R1: Chapter 16-17, Class notes. |
| 13 | 4 | - To get familiar with the various applications of broadcasting and multicasting. | Broadcast and Multicast addresses, Multicast Socket options, groups. | T1: Chapters 20, 21, Class notes. |
| | Total number of Lectures: 42 | | | |

Evaluation Scheme:

| Component | Duration | Weightage (%) | Date & Time | Nature of Component |
|---|------------|---------------|---|---------------------|
| Mid-Semester Exam | 90 Mins | 20% | 11/3 9.00 - 10.30AM | Closed Book |
| Quiz 1 | 15-20 mins | 5% | 4 th week of February | Closed Book |
| Quiz 2 | 15-20 mins | 5% | 1 st week of April | Closed Book |
| Course Project/Home Assignment (with final viva/presentation) | - | 30% | Details will be announced during 2nd week of January. Final evaluation during 1 st and second week of April. | Open Book/Take Home |
| Comprehensive Exam | 3 hrs. | 40% | 01/05 FN | Closed Book. |

Chamber Consultation Hour: To be announced in class.

Notices: All notices pertaining to this course will be displayed on the CS&IS Notice Board or CMS.

Make-up Policy:

- **No Make-ups for Quizzes under any circumstances.**
- Prior permission of the Instructor-in-Charge is required to get make-up for the Mid-Sem. Only on producing documentary proof of possible absence, which proves that student would be physically unable to appear for the exam, the decision of granting the make-up will be taken.
- Prior permission of Dean, Instruction Division is required to get for the make-up of the comprehensive exam. Instructor-in-charge's/Dean's decision in the matter of granting make-up would be final.



Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE

