

Computational Thinking

Discrete Mathematics

Number Theory

Topic 00 : Module Introduction

Logic

Lecture 01 : Module Overview

Dr Kieran Murphy 

Computing and Mathematics, SETU (Waterford).
(kieran.murphy@setu.ie)

Graphs and
Networks

Autumn Semester, 2023

Collections

Outline

- Motivation and aim of this module.
- Administration trivia — Contact hours, Assessment structure, ...
- Resources

Enumeration

Relations & Functions

Outline

1. Module Introduction

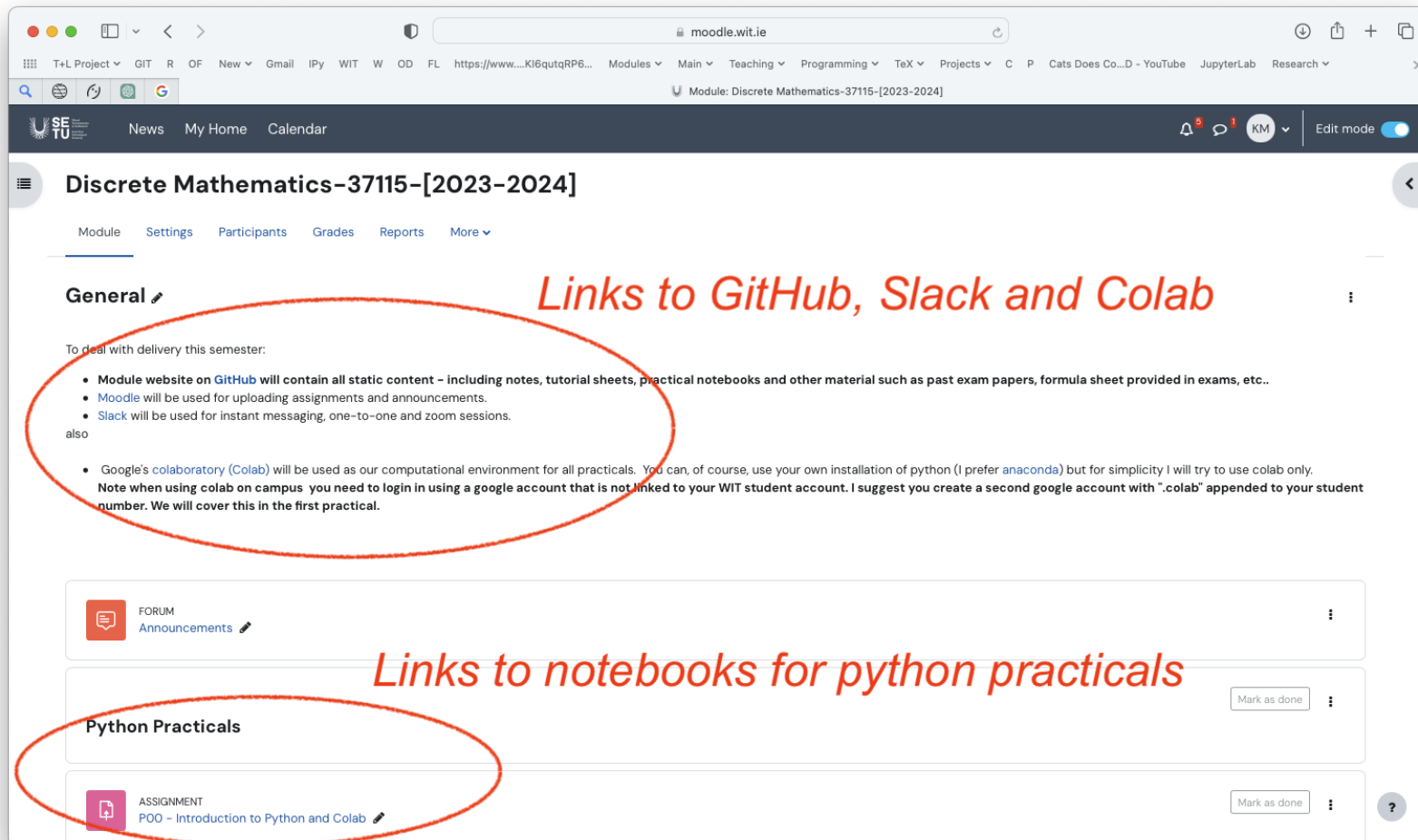
2

1.1. Resources

3

Resources — Moodle

- URL: moodle.wit.ie/course/view.php?id=201785
- Used for all notices, assignment and practical work submissions.



The screenshot shows the Moodle course page for Discrete Mathematics-37115-[2023-2024]. The page is titled "Discrete Mathematics-37115-[2023-2024]" and has tabs for Module, Settings, Participants, Grades, Reports, and More. The "General" section is active, showing a list of links to GitHub, Slack, and Colab. A red circle highlights this section, with the text "Links to GitHub, Slack and Colab" written in red. Below this, the "Python Practicals" section is visible, containing an assignment titled "P00 - Introduction to Python and Colab". A red circle highlights this section, with the text "Links to notebooks for python practicals" written in red.

General

To deal with delivery this semester:

- Module website on [GitHub](#) will contain all static content – including notes, tutorial sheets, practical notebooks and other material such as past exam papers, formula sheet provided in exams, etc..
- Moodle will be used for uploading assignments and announcements.
- Slack will be used for instant messaging, one-to-one and zoom sessions.

also

- Google's [colaboratory \(Colab\)](#) will be used as our computational environment for all practicals. You can, of course, use your own installation of python (I prefer [anaconda](#)) but for simplicity I will try to use colab only. Note when using colab on campus you need to login in using a google account that is not linked to your WIT student account. I suggest you create a second google account with ".colab" appended to your student number. We will cover this in the first practical.

FORUM
Announcements

Python Practicals

ASSIGNMENT
P00 - Introduction to Python and Colab

Resources — Github

- URL: [SETU-DiscreteMathematics.github.io/live](https://setu-discretemathematics.github.io/live)
- Used for all content (slides, notebooks, tutorial sheets).

The screenshot shows the website [setu-discretemathematics.github.io](https://setu-discretemathematics.github.io/live/index.html) in a browser. The page has a navigation bar with links to Moodle and Slack circled in red. The main content area is divided into sections: Module Introduction, Computational Thinking, Logic, and Collections. Each section has a title, an image, and a description. Red ovals highlight the text in each section, and red arrows point from the text 'Links to notes and python notebooks' to the highlighted text in the 'Computational Thinking', 'Logic', and 'Collections' sections. The 'Module Introduction' section contains a diagram of a network. The 'Computational Thinking' section features a cartoon of a dog. The 'Logic' section includes a cartoon of a person thinking. The 'Collections' section shows a group of people.

Links to Moodle and Slack

Discrete Mathematics

Links to notes and python notebooks

Module Introduction

We will start this module with a short overview of the module aims and objectives, and a summary of what you should expect from us and what we expect from you during the module.

Computational Thinking

The main aim of this module is to learn to offload hard (and/or boring) computational tasks to computers rather than solving them ourselves. You won't master this skill in a single semester but we will get you started on this path by covering fundamental structures common to mathematics and computing and how we translate between mathematical notation and computing languages (Python).

Logic

In this section, on **propositional calculus**, we will discuss how we analyse **statements** and how to construct more complex statements using **logical operators**. This is basis on how computers (and sometimes humans) make decisions.

Collections

In this section, on **collections**, we will cover the three fundamental structures for storing multiple items (pieces of data): **sets**, **lists**, and **dictionaries**. While these structures may have different names and different implementations across different programming languages, the differences are usually trivial. We will cover the mathematical concepts that motivated these structures, the mathematical notation used and their resulting implementation in Python.

Resources I

(Accessing content)



- URL: moodle.wit.ie/course/view.php?id=201785
- Used for all notices, assignment and practical work submissions.



- URL: SETU-DiscreteMathematics.github.io/live
- Used for all content (slides, notebooks, tutorial sheets).



- URL: discretemathe-7co3349.slack.com
- Used for instant messaging, one-on-one sessions, etc.

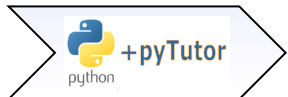
Resources II

(Python)



We will use python for all of our computational work.

- We will use the online Google Colab* environment for python, to code in python and for all of our practical work.
- You can open a notebook from these slides by clicking the "Open in COLAB" icon or clicking/scanning the QR code



PyTutor (pythontutor.com) is a website that helps programmers to learn Python, Javascript, C/C++, and Java by visualising code execution (shows what happens to data as code runs, line by line).

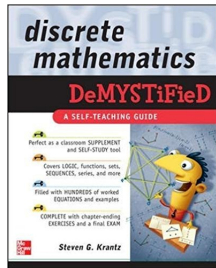


*Alternatively, if you want to install python on your laptop you could use the anaconda distribution from www.anaconda.com (just install the latest 64-bit, version 3.+).

Text Books

I

I like the following textbooks on discrete mathematics and expect that my notes will overlap significantly with these books. I do encourage you to read* them[†], however, be aware they may use different notation or cover different topics.



Discrete Mathematics Demystified

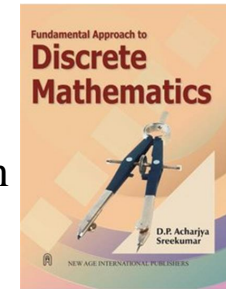
by Steven Krantz

Touches on nearly all of the topics that we hope to cover. We will probably go into greater depth in places, but a very nice and short read.

Fundamental Approach to Discrete Mathematics

by D. P. Acharjya Sreekumar

I also liked this book, however, due to time constraints, this module only focuses on material in chapter 1–4, 8, and 10.



*or skim them over a coffee or two.

[†]I also like *Applied Discrete Structures* by Alan Doerr and Kenneth Levasseur — it is a good source of exercises. (and is free (legally))

Final Comments on Module

- Discrete Mathematics concepts appear either directly or indirectly in approximately 22 of the 30 modules on your degree.
 \implies *Knowing Discrete Mathematics concepts greatly simplifies rest of the course.*
- The module is intended to be an introduction to a large number of topics, so treatment is broad rather than deep.
 - ✓ Most of material is at an introductory level.
 - ⚠ Keeping in sync with material, practicals and tutorials is important.
- The continuous assessment (the practicals) is intended to reinforce the connections between programming and discrete mathematics.

The CA is a “carrot not a stick” — we want you to enjoy the module and keep up to date with the material.

