

# ES112 course plan

(Aug-Nov 2024) (class strength: 383)

## Instructors:

[Yogesh Kumar Meena](#) (doubt sessions: by appointment ONLY at AB13/401A)

[Shouvik Mondal](#) (doubt sessions: by appointment ONLY at AB13/402A)

*In this course, there will be ONE lecture, and ONE lab session per week. The L-T-P-C for this course is (1.5-0-1.5-3) which means a weekly load of: 1.5 hrs of lecture, 0 hrs of tutorial, 1.5 hrs of lab, and overall 3 credits for this course. Our first lab session (batches 1.1, 1.2, 2.1, 2.2) is on 21/08/2024, and the first lecture (all batches) is on 22/08/2024. In slot F2, all students can be accommodated as Jasubhai Audi. has a capacity of 550. Each of the lab rooms are of 70 capacity, so only 280 will have their lab session for a particular week in slot P1, the rest will have their session for that week in slot P2.*

## TAs Organization:

Yogesh, Shouvik [I+L]					
Batch 1.1	Batch 1.2	Batch 2.1	Batch 2.2	Batch 3.1	Batch 3.2
Ramanand (L)	Yash Sahu (L)	Isha Jain (L)	Arjun Badola (L)	Koustav Das (L)	Krupa Chetanbhai Rajani (L)
[P1] Wed, 17:00–18:20	[P1] Wed, 17:00–18:20	[P1] Wed, 17:00–18:20	[P1] Wed, 17:00–18:20	[P2] Fri, 17:00–18:20	[P2] Fri, 17:00–18:20
Venugopal Bhamidi	Rabina Shrestha	Mukul Paras Potta	Madhusudhanan K	M Siddhartha	Prathamesh P. Shanbhag
Tanmay Ramhari Somkuwar	Yasir Mohi Ud Din	Preyum Kumar	Tanmay Saurave	Gautham Bharati B	Kaloori Shiva Prasad
Palak Gupta	Abhyudaya Nair	Ayushman Singh	Ejisaya Naik	Mallika Chouhan	Suruchi Hardaha
Abhiroop Chintalapudi	Vinayak Rana	Vaishnav Koka	Shruti Dubey	Sayak Dutta	Krish Srivastava
Shivansh Gupta	Poomima Bhatia	Rugved Milind Patil	Sri Sai Karthik Kanukollu	Dhruv Satish Patel	Harsh Verma
Lead TA roles: Logistics, manage lab TAs, consolidate evaluations, release lab assignments & solutions.					
Lab. TA roles: Manage in-lab activities (one-on-one doubts sessions, evaluations).					
All TAs: Design problems & solutions based on the seed question bank provided by instructors.					
All TAs are expected to be familiar with HackerRank (the browser-based web application)					
Instructors: Lectures, validate design problems & solutions.					
Reporting: Lab TA>Lead TA> Instructors					

## ADH Mentors:

Shrey Jwalant Joshi, Harshita Singh, Chardiya Vanshribahen Rajeshbhai, Harinarayan J, Nishchay Bhutoria, Aditya Mehta, Nupoor Assudani, Shardul Rakesh Junagade, Siddhesh Umarjee, Tanish Yelgoe

## Lectures:

- (Slot **F2**): Thu, 11:30–12:50 @ Jasubhai Auditorium

## Lab sessions:

- (Slot **P1**): Wed, 17:00–18:20
  - Batch 1.1 (@ AB10/104)
  - Batch 1.2 (@ AB10/105)
  - Batch 2.1 (@ AB7/108)
  - Batch 2.2 (@ AB7/109)
- (Slot **P2**): Fri, 17:00–18:20
  - Batch 3.1 (@ AB10/104)
  - Batch 3.2 (@ AB10/105)

## Evaluation (relative grading):

- [25%] Theory Exam I (2 – 4 PM, Sep 28, 2024) @Jasubhai Audi., @Jibaben (AB1/103)
- [25%] Theory Exam II (9 – 11:30 AM, Nov 28, 2024) @Jasubhai Audi., @Jibaben (AB1/103)
- [15%] Lab Exam I (**L4**: Sep 11, 13)

- [15%] Lab Exam II (L8: Oct 23, 25)
- [20%] Lab Exam III (L12: Nov 20, 22)

Note #1: There will be no makeup exams, re-exams, or reschedules.

Note #2: For AY 2024-25, 23 Aug 2024 will have the timetable for Thursday and 18 Sep 2024 will have the timetable for Monday.

Note #3: There is no prerequisite for this course except sincerity, honesty, and ethics. Do not worry if you have zero experience on computer programming, as everything will be taught from scratch, plus the onus is on you to revise the slides before coming to class, and regularly practice programming on a computer system. Any system (w/o Internet) with Python >=3.10 installed will be sufficient for the lab experiments. Note that the computer labs at IITGN have a dedicated system (desktop) per student. There will be 70 students per batch as the lab rooms (10/104, 10/105, 7/108, 7/109) have 70 desktops each. However, you may bring your own systems if you wish. Lab sessions will take place online on [HackerRank](#) (web application) wherein your account must be associated with your <rollno>@iitgn.ac.in email. Any other account will be ignored. The usage of the online mode is recommended as it does not need you to locally install Python as the web application is integrated with the necessary and sufficient software required for the experiments. However, when using a computer system belonging to the lab, make sure to do a proper logout from your HackerRank account. Otherwise, the next person using that system will automatically bypass login and overwrite your work which cannot be recovered. The onus is on you to make sure this is taken care of.

### Overall course load:

{12L (x1)} + {12P (x2)}

Blue: Jasubhai (550x)

Red: AB10/104 (70x), AB10/105 (70x), AB7/108 (70x), AB7/109 (70x)

### Timeline:

Excluding holidays and breaks. ? indicates lab slots consumed by institute-reschedules/holidays/exams/breaks.

Month	Day	Topics (slides)
August	Lec.: 22, 23 <sub>(Thu)</sub> , 29 Lab.: (21/22)~L1, (28/30)~L2	<p>(Why Program?) (Variables, Expressions, and Statements)</p> <p><a href="#">Lecture 1-2 slides</a>  <a href="#">Take Home Exercise (THE #1)</a>  <a href="#">HackerRank link (THE #1)</a> <ul style="list-style-type: none"> <li>• <a href="#">basic_calc.py</a></li> <li>• <a href="#">basic_datatypes.py</a></li> </ul> </p> <p><a href="#">Lecture 3 slides</a>  <a href="#">Take Home Exercise (THE #2)</a>  <a href="#">HackerRank link (THE #2)</a> <ul style="list-style-type: none"> <li>• <a href="#">gross_pay.py</a></li> <li>• <a href="#">temp_conv.py</a></li> <li>• <a href="#">start_rotate_stop.py</a></li> </ul> </p> <p>21/22 Aug Lab 1 (Demo session for all batches): <ul style="list-style-type: none"> <li>• <a href="#">Starting Python from different environments</a></li> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> </p> <p>28 Aug Lab 2 (Wednesday batch): <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> </p> <p>30 Aug Lab 2 (Friday batch): <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> </ul> </p>

		<ul style="list-style-type: none"> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul>
September	<p>Lec.: <a href="#">5</a>, <a href="#">12</a>, <a href="#">19</a>, <a href="#">26</a>  Lab.: <a href="#">(4/6)</a>~L3, (<a href="#">11/13</a>)~L4 (lab exam I), (<a href="#">?/20</a>)~L5, (<a href="#">25/?</a>)~L6</p> <p>ADH Sessions:</p> <ul style="list-style-type: none"> <li>• <a href="#">Sep 8</a></li> <li>• <a href="#">Sep 9</a></li> <li>• <a href="#">Sep 13</a></li> <li>• <a href="#">Sep 18</a></li> <li>• <a href="#">Sep 19</a></li> <li>• <a href="#">Sep 22</a></li> <li>• <a href="#">Sep 25</a></li> <li>• <a href="#">Sep 27</a></li> </ul> <p>11 Sep Lab 4 (Exam I) (Wednesday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p>13 Sep Lab 4 (Exam I) (Friday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p><a href="#">Theory Exam I Questions+Solutions</a></p>	<p>(Variables, Expressions, and Statements) - cont'd  (Conditional Execution)  (Functions)  (Loops and Iteration)</p> <p><a href="#">Lecture 4 slides</a>  <a href="#">Take Home Exercise (THE #3)</a>  <a href="#">HackerRank link (THE #3)</a></p> <ul style="list-style-type: none"> <li>• <a href="#">[pattern_sum.py]</a></li> <li>• <a href="#">[first_n+1_terms.py]</a></li> <li>• <a href="#">[roots_quadratic.py]</a></li> <li>• <a href="#">[grade_steel.py]</a></li> <li>• <a href="#">[rounded_terms.py]</a></li> <li>• <a href="#">[dec_to_base_k.py]</a></li> </ul> <p><a href="#">Lecture 5 slides</a>  <a href="#">Take Home Exercise (THE #4)</a>  <a href="#">HackerRank link (THE #4)</a></p> <ul style="list-style-type: none"> <li>• <a href="#">[OR_operators.py]</a></li> <li>• <a href="#">[pattern-1.py]</a></li> <li>• <a href="#">[count_prime.py]</a></li> <li>• <a href="#">[divide_try_except.py]</a></li> <li>• <a href="#">[cumulative_bitwise.py]</a></li> </ul> <p><a href="#">Lecture 6 slides</a>  <a href="#">Take Home Exercise (THE #5)</a>  <a href="#">HackerRank link (THE #5)</a></p> <ul style="list-style-type: none"> <li>• <a href="#">[fact_prime_function.py]</a></li> <li>• <a href="#">[classify_grade.py]</a></li> <li>• <a href="#">[interval_correction.py]</a></li> <li>• <a href="#">[economic_order_quantity.py]</a></li> <li>• <a href="#">[shipping_cost.py]</a></li> <li>• <a href="#">[http_status_code.py]</a></li> <li>• <a href="#">[pattern_extra.py]</a></li> <li>• <a href="#">[biggest_among_three.py]</a></li> <li>• <a href="#">[stuart_little_1.py]</a></li> <li>• <a href="#">[stuart_little_2.py]</a></li> </ul> <p><a href="#">Lecture 7 slides</a>  <a href="#">Take Home Exercise (THE #6)</a>  <a href="#">HackerRank link (THE #6)</a></p> <ul style="list-style-type: none"> <li>• <a href="#">[count_primes.py]</a></li> <li>• <a href="#">[http_status_code.py]</a></li> <li>• <a href="#">[mixed_pattern.py]</a></li> <li>• <a href="#">[pattern_1.py]</a></li> <li>• <a href="#">[pattern_2.py]</a></li> <li>• <a href="#">[pattern_3.py]</a></li> <li>• <a href="#">[pattern_4.py]</a></li> <li>• <a href="#">[pattern_5.py]</a></li> <li>• <a href="#">[pattern_6.py]</a></li> <li>• <a href="#">[pattern_7.py]</a></li> <li>• <a href="#">[pattern_8.py]</a></li> <li>• <a href="#">[pattern_print.py]</a></li> <li>• <a href="#">[pattern_sum.py]</a></li> <li>• <a href="#">[print_n_elements.py]</a></li> </ul> <p>04 Sep Lab 3 (Wednesday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p>06 Sep Lab 3 (Friday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul>

		<p>20 Sep Lab 5 (Friday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p>25 Sep Lab 6 (Wednesday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul>
October	<p>Lec.: <a href="#">17</a>, <a href="#">24</a>  Lab.: (<a href="#">16/18</a>)~L7, (<a href="#">23/25</a>)~L8 (lab exam II), (<a href="#">30/</a>*</p> <p>ADH Sessions:</p> <ul style="list-style-type: none"> <li>• <a href="#">Oct 17</a></li> <li>• <a href="#">Oct 22</a></li> <li>• <a href="#">Oct 24</a></li> </ul> <p>23 Oct Lab 8 (Exam II) (Wednesday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p>25 Sep Lab 8 (Exam II) (Friday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul>	<p>(Strings)  (Lists)  (Reading Files)</p> <p><a href="#">Lecture 8 slides</a>  <a href="#">Take Home Exercise (THE #7)</a>  <a href="#">HackerRank link (THE #7)</a></p> <ul style="list-style-type: none"> <li>• <a href="#">[password_strength.py]</a></li> <li>• <a href="#">[first_occurrence.py]</a></li> <li>• <a href="#">[skip_vowels.py]</a></li> <li>• <a href="#">[skip_consonant.py]</a></li> <li>• <a href="#">[sequence_alphabet.py]</a></li> <li>• <a href="#">[alphabetic_pattern_1.py]</a></li> <li>• <a href="#">[alphabetic_pattern_2.py]</a></li> <li>• <a href="#">[maximum_cont_lowercase.py]</a></li> <li>• <a href="#">[longest_word.py]</a></li> </ul> <p><a href="#">Lecture 9 Slides</a></p> <p>16 Oct Lab 7 (Wednesday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p>18 Oct Lab 7 (Friday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p>30 Oct Lab 9 (Wednesday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul>
November	<p>Lec.: <a href="#">7</a>, <a href="#">14</a>, <a href="#">21</a>  Lab.: <a href="#">*/1</a>)~L9, (<a href="#">6/?</a>)~L10, (<a href="#">13/?</a>)~L11, (<a href="#">20/22</a>)~L12 (lab exam III)</p> <p>20 Nov Lab 12 (Exam III) (Wednesday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p>22 Nov Lab 12 (Exam III) (Friday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> </ul>	<p>(Dictionaries)  (Tuples)</p> <p><a href="#">Lecture 10 slides</a>  <a href="#">Take Home Exercise HackerRank link (THE #8)</a></p> <ul style="list-style-type: none"> <li>• <a href="#">[codes.zip]</a></li> </ul> <p>01 Nov Lab 9 (Friday batch):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p>06 Nov Lab 10 (Revision – All batches):</p>

	<ul style="list-style-type: none"> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul> <p><a href="#">Theory Exam II Questions+Solutions</a></p>	<ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a> (selected questions from prior lab sessions)</li> </ul> <p>13 Nov Lab 11 (All batches):</p> <ul style="list-style-type: none"> <li>• <a href="#">HackerRank contest</a></li> <li>• <a href="#">Questions</a></li> <li>• <a href="#">Questions+Instructions</a></li> <li>• <a href="#">Questions+Instructions+Solutions</a></li> </ul>
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## Course Contents:

*(tentative and subject to change at the sole discretion of the instructors)*

### 1. Elementary Programming Techniques

Building familiarity with instruction driven task completion using Scratch or CS Unplugged.

Von Neumann architecture, the translation process for a program (Source code ->

Interpreter/Compiler -> Machine code)

Expressions: values or literals, combining values using operators, basic types (int, float, str, bool); type conversion; lazy evaluation for Boolean operators.

Functions (scope), examples from math and random; writing your own simple functions that do not require control flow; (e.g., "celsius\_to\_fahrenheit")

Program development life cycle (edit, test, debug; libraries such as pytest, simple\_benchmark; and tools such as flake8)

Control flow: conditionals (if-else, match); loops (while, for).

### 2. Advanced Data Types

Tuples: construction, unpacking.

Lists: construction (+ comprehensions), indexing, slicing.

Sets: construction, selection, set operations.

Dictionaries: construction, indexing, update, merging.

Complex data (dictionaries of lists to lists etc.); frozenset, frozendict.

Objects and Classes

Exceptions: try-catch-finally, writing your own exceptions.

### 3. Advanced Programming Techniques

Recursion (basic examples such as Fibonacci and Towers of Hanoi)

Functions as values (functools)

Iterators and generators (itertools, more-itertools)

### 4. Programming in the Large

Modules: code organization

Selection of python modules (e.g, re, numpy, scipy, beautifulsoup, flask, etc).

Student Honour Code: [<https://iitgn.ac.in/students/honourcode>]

## Texts/References:

1. The official Python tutorial and reference
2. Dive Into Python 3, Mark Pilgrim
3. Learn Python the hard way, Zed A Shaw
4. A byte of Python, Swaroop CH
5. Automate the boring stuff with Python, Al Sweigart