

# Development Tasks

March 19, 2025

## 1 Software developer team

Your task is to create a timetable for IISERB that ensures:

1. No two courses assigned to the same instructor overlap.
2. No student is assigned two courses at the same time.
3. Each course is scheduled in an available classroom.
4. Classrooms cannot be double-booked.
5. Classes are held from 9 am to 6 pm.

The courses and time-table can be found at  
[https://acad.iiserb.ac.in/pdf\\_docs/schedule/Class\\_TT\\_2024\\_2025\\_II\\_Semester.pdf](https://acad.iiserb.ac.in/pdf_docs/schedule/Class_TT_2024_2025_II_Semester.pdf)

**Note: You are allowed to create your own slot systems**

### Front-end developers:

Design the front end of a software that generates a conflict-free timetable given a set of constraints.

### Back-end developers:

Design the back end of a software that generates a conflict-free timetable given a set of constraints.

## 2 Quantum Physics team

Design the software that implements BB84 and E92 protocols displaying Quantum bit error rate (QBER).

### 3 Rest of the teams

I am required to generate a polynomial

$$f(x) = \sum_{i=0}^{2^n-1} a_i x^i$$

such that each  $a_i$  satisfies  $0 \leq a_i \leq 1, \forall i \in \{0, 1, \dots, 2^n - 1\}$  and  $\sum_{i=0}^{2^n-1} a_i = 1$ .

To generate  $a_i, i \in \{0, 1, 2, \dots, 2^n - 1\}$  follow the following steps:

1. Divide real line interval  $[-25, 25]$  into  $2^n$  intervals upto your machine precision.
2. Call each interval  $I_i$
3. Uniformly pick a  $y \in I_i$
4. Generate  $a_i$  via  $a_i = \frac{1}{\sqrt{2\pi}} e^{-\frac{y^2}{2}}$

Vary  $n$  and find out the dependence of the

- number of real roots of  $p(x)$  on  $n$ ,
- number of complex roots with negative real parts on  $n$ .