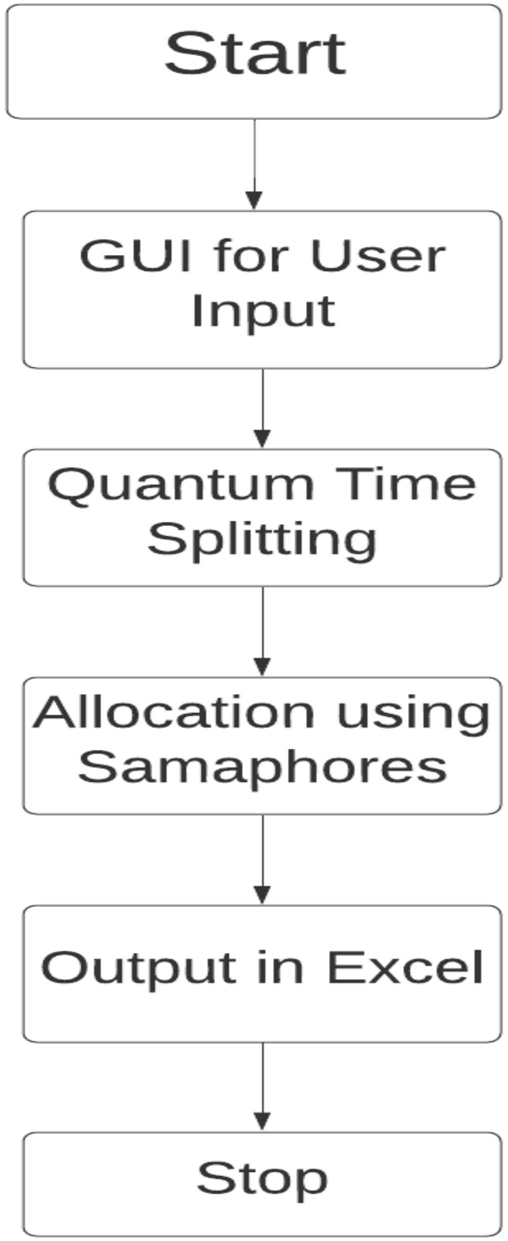
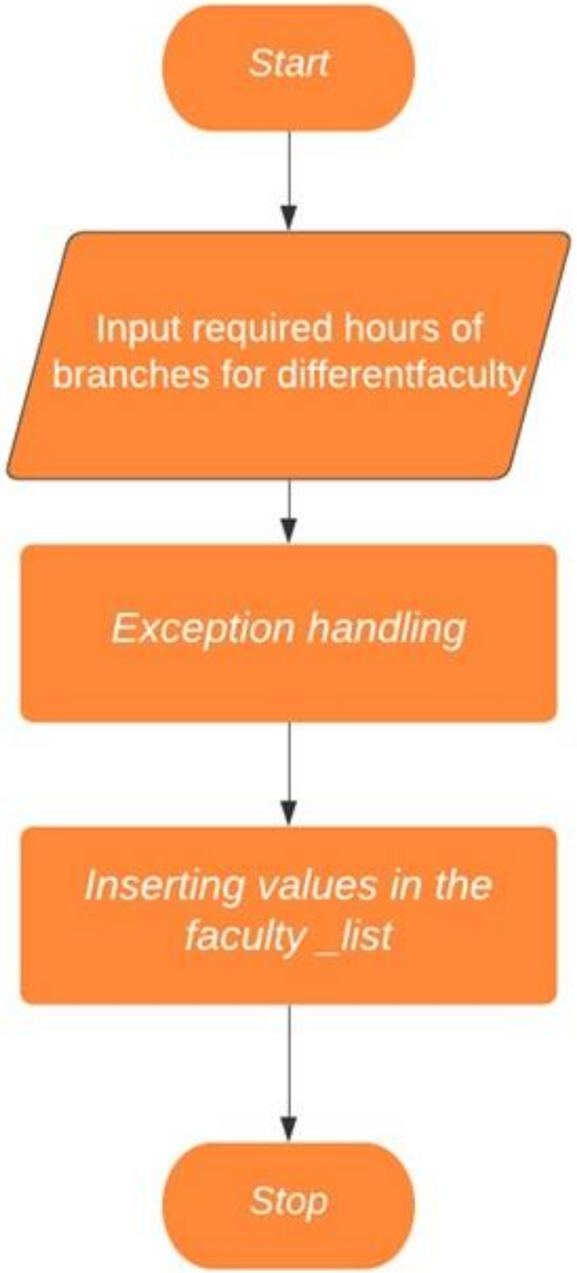
# Timetable Generation

## Block Diagram



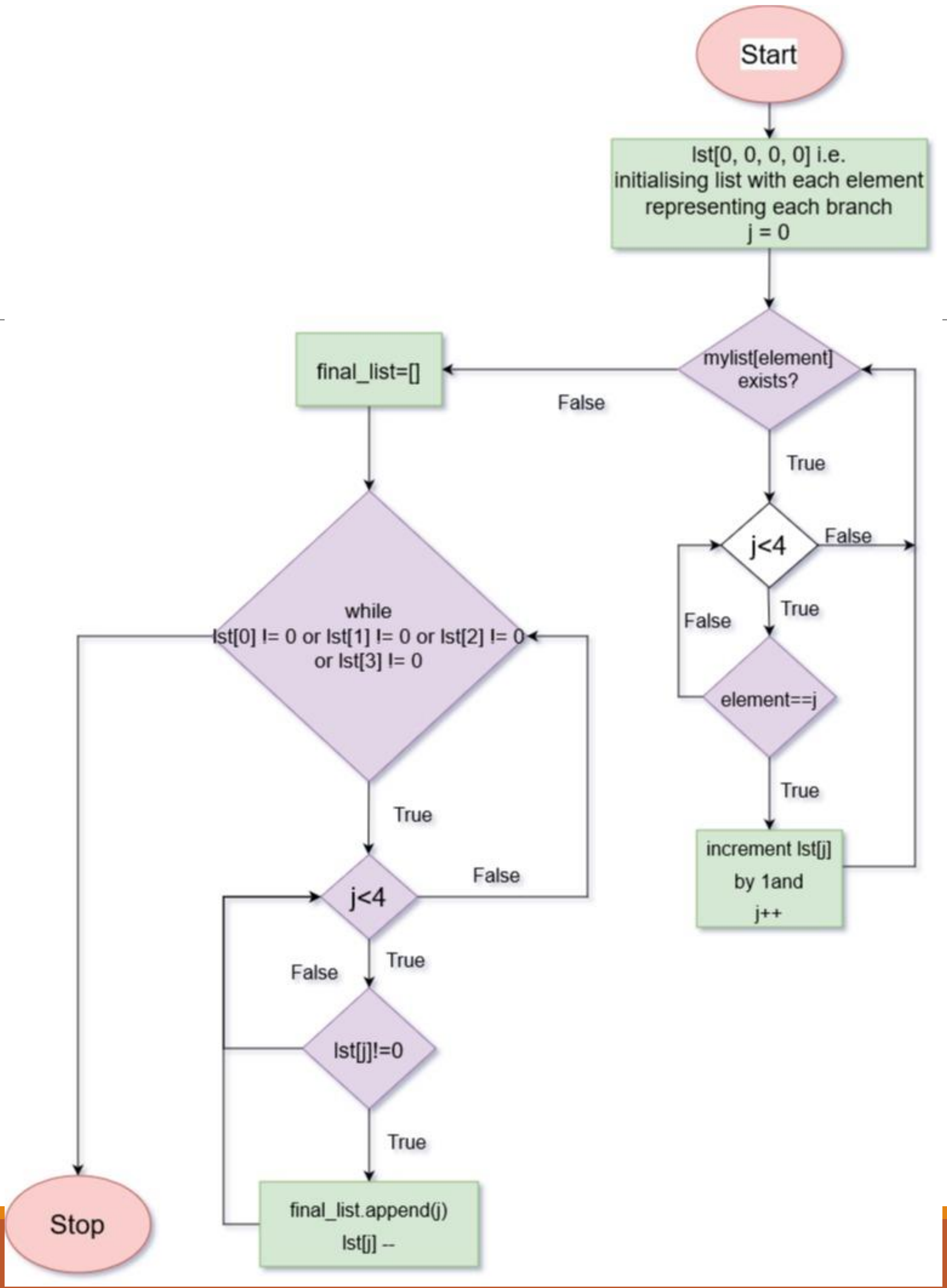
# Flowchart for GUI

Sample input: ‘2’, ’2’, ’3’, ’2’
Sample output: 001122233

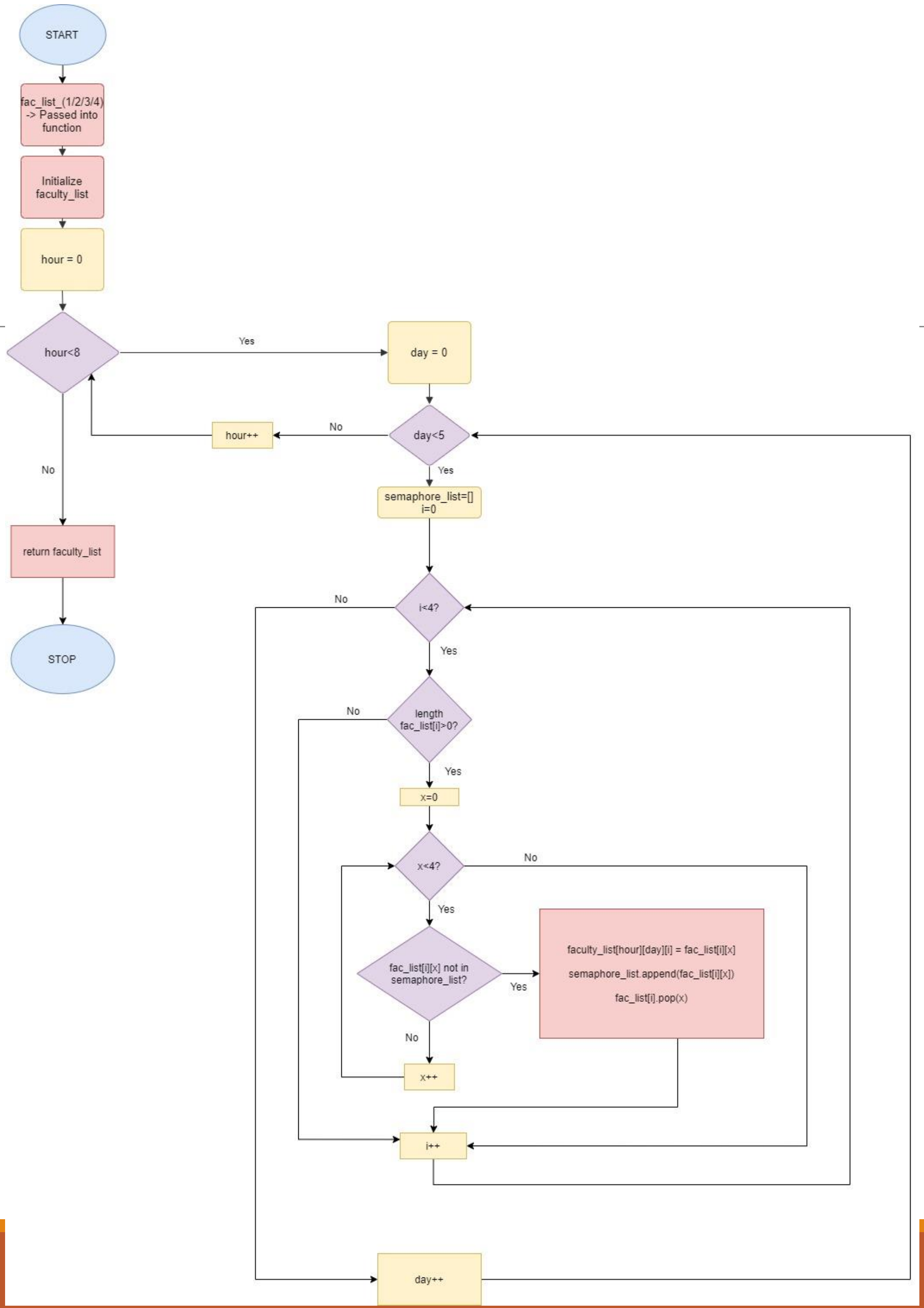

Start
Input required hours of branches for differentfaculty
Exception handling
Inserting values in the faculty _list
Stop

# Flowchart for Quantum Time Splitter

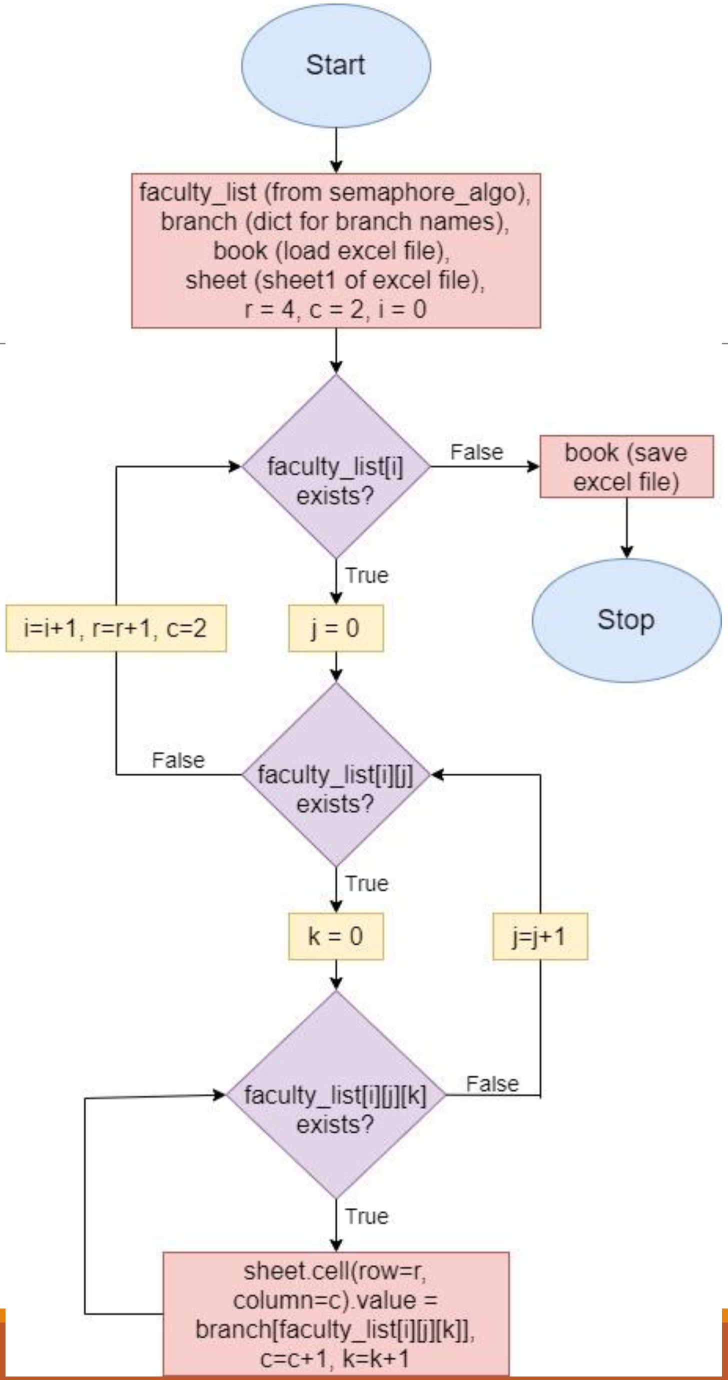
Sample input: 001122233
Sample output: 012301232


Start
lst[0, 0, 0, 0] i.e. initialising list with each element representing each branch j = 0
mylist[element] exists?
False
True
final_list=[]
j<4
False
True
False
element==j
True
increment lst[j] by 1and j++
while lst[0] != 0 or lst[1] != 0 or lst[2] != 0 or lst[3] != 0
True
j<4
False
True
False
lst[j]!=0
True
final_list.append(j) lst[j] --
Stop

# Flowchart for Allocation using Semaphores



# Flowchart for Excel File Manipulation


Start
faculty_list (from semaphore_algo), branch (dict for branch names), book (load excel file), sheet (sheet1 of excel file), r = 4, c = 2, i = 0
faculty_list[i] exists?
False
book (save excel file)
Stop
True
j = 0
i=i+1, r=r+1, c=2
faculty_list[i][j] exists?
False
True
k = 0
j=j+1
faculty_list[i][j][k] exists?
False
True
sheet.cell(row=r, column=c).value = branch[faculty_list[i][j][k]], c=c+1, k=k+1

# Software and Hardware requirements

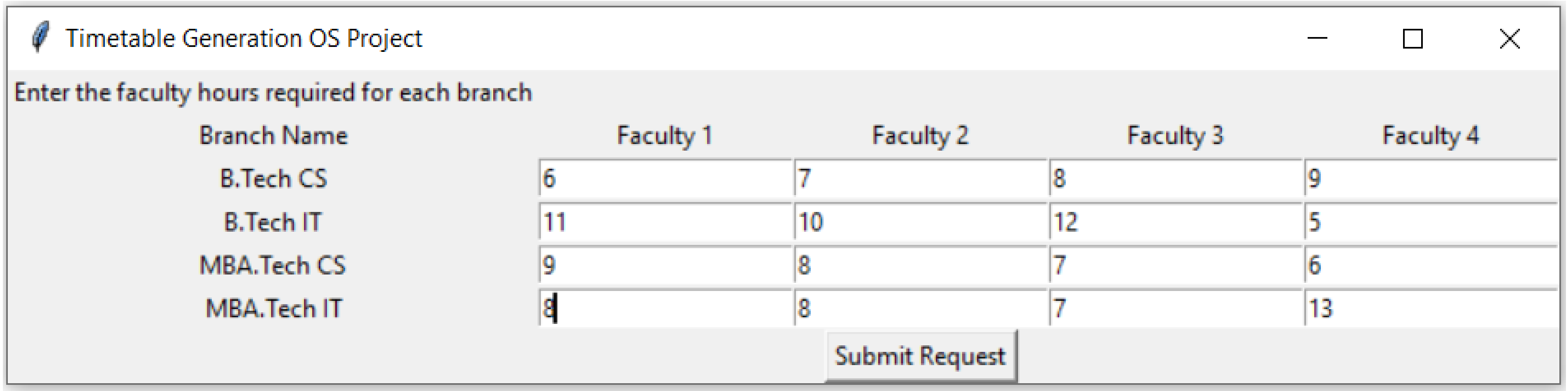
SOFTWARE REQUIREMENTS

- Operating system – Windows 10 is used as the operating system as it is stable and supports more features and is more user friendly.
- Development tools and Programming language – Python is used to write the whole code and Python Tkinter is used for designing and styling of front end. PyCharm IDE has been used but any other IDE or text editor can also be used. Python libraries used are tkinter (for GUI) and openpyxl (for excel file manipulation).
- Spreadsheet application – MS Excel has been used to store and display the timetable generated.

HARDWARE REQUIREMENTS

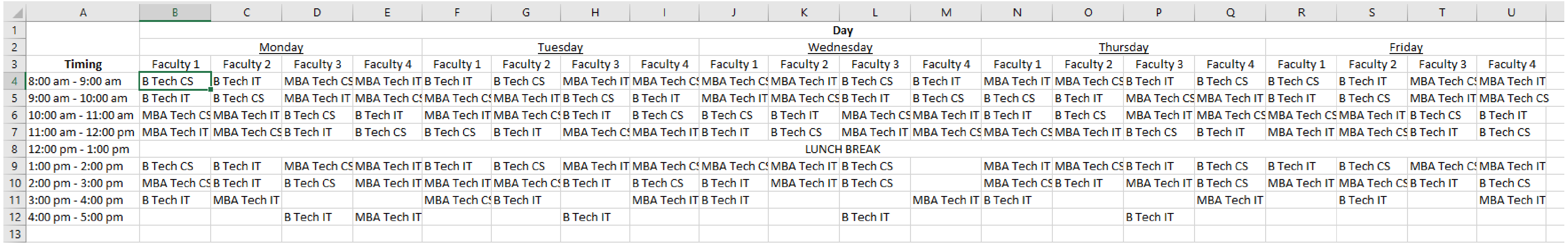
- Intel core i7 8th generation is used as a processor. Intel core i3 should also suffice.
- 8 GB RAM is used. Minimum of 1 GB RAM is advisable.

# GUI & output screenshots



Enter the faculty hours required for each branch

| Branch Name | Faculty 1 | Faculty 2 | Faculty 3 | Faculty 4 |
|---|---|---|---|---|
| B.Tech CS | 6 | 7 | 8 | 9 |
| B.Tech IT | 11 | 10 | 12 | 5 |
| MBA.Tech CS | 9 | 8 | 7 | 6 |
| MBA.Tech IT | 8 | 8 | 7 | 13 |



| | Day | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Monday | | | | Tuesday | | | | Wednesday | | | | Thursday | | | | Friday | | | |
| **Timing** | Faculty 1 | Faculty 2 | Faculty 3 | Faculty 4 | Faculty 1 | Faculty 2 | Faculty 3 | Faculty 4 | Faculty 1 | Faculty 2 | Faculty 3 | Faculty 4 | Faculty 1 | Faculty 2 | Faculty 3 | Faculty 4 | Faculty 1 | Faculty 2 | Faculty 3 | Faculty 4 |
| 8:00 am - 9:00 am | B Tech CS | B Tech IT | MBA Tech CS | MBA Tech IT | B Tech IT | B Tech CS | MBA Tech IT | MBA Tech C | MBA Tech C | MBA Tech IT | B Tech CS | B Tech IT | MBA Tech IT | MBA Tech CS | B Tech IT | B Tech CS | B Tech CS | B Tech IT | MBA Tech C | MBA Tech IT |
| 9:00 am - 10:00 am | B Tech IT | B Tech CS | MBA Tech IT | MBA Tech C | MBA Tech C | MBA Tech IT | B Tech CS | B Tech IT | MBA Tech IT | MBA Tech CS | B Tech IT | B Tech CS | B Tech CS | B Tech IT | MBA Tech CS | MBA Tech IT | B Tech IT | B Tech CS | MBA Tech IT | MBA Tech CS |
| 10:00 am - 11:00 am | MBA Tech CS | MBA Tech IT | B Tech CS | B Tech IT | MBA Tech IT | MBA Tech C | B Tech IT | B Tech CS | B Tech CS | B Tech IT | MBA Tech CS | MBA Tech IT | B Tech IT | B Tech CS | MBA Tech IT | MBA Tech CS | MBA Tech CS | MBA Tech IT | B Tech CS | B Tech IT |
| 11:00 am - 12:00 pm | MBA Tech IT | MBA Tech CS | B Tech IT | B Tech CS | B Tech CS | B Tech IT | MBA Tech C | MBA Tech IT | B Tech IT | B Tech CS | MBA Tech IT | MBA Tech CS | MBA Tech CS | MBA Tech IT | B Tech CS | B Tech IT | MBA Tech IT | MBA Tech CS | B Tech IT | B Tech CS |
| 12:00 pm - 1:00 pm | | | | | | | | | | LUNCH BREAK | | | | | | | | | | |
| 1:00 pm - 2:00 pm | B Tech CS | B Tech IT | MBA Tech CS | MBA Tech IT | B Tech IT | B Tech CS | MBA Tech IT | MBA Tech C | MBA Tech C | MBA Tech IT | B Tech CS | | MBA Tech IT | MBA Tech CS | B Tech IT | B Tech CS | B Tech IT | B Tech CS | MBA Tech C | MBA Tech IT |
| 2:00 pm - 3:00 pm | MBA Tech CS | B Tech IT | B Tech CS | MBA Tech IT | MBA Tech IT | MBA Tech C | B Tech IT | B Tech CS | B Tech IT | MBA Tech IT | B Tech CS | | MBA Tech CS | B Tech IT | MBA Tech IT | B Tech CS | MBA Tech IT | MBA Tech CS | B Tech IT | B Tech CS |
| 3:00 pm - 4:00 pm | B Tech IT | MBA Tech IT | | | MBA Tech C | B Tech IT | | MBA Tech IT | B Tech IT | | | MBA Tech IT | B Tech IT | | | MBA Tech IT | | B Tech IT | | MBA Tech IT |
| 4:00 pm - 5:00 pm | | | B Tech IT | MBA Tech IT | | | B Tech IT | | | | B Tech IT | | | | B Tech IT | | | | | |

## Correlation with OS concepts

- Process Management – In this project, the different branches (B Tech CS, B Tech IT etc.) act as the processes competing for resources (in this case the resource is memory in the form faculty time)
- File Management – The only file management taking place is in the form of excel file creation for the timetable. As such there is no need to use a particular algorithm since the system is not dealing with multiple files here. It is made sure that the timetable generated previously for different set of input values does not affect other generations.
- Thread efficient utilization of resources – For the efficient utilization of memory (faculty time), the process (total requirement of a branch for a particular faculty in hours) is broken down into threads (total requirement in hours is split into quantum of 1 hour using the quantum time splitter code).

## Correlation with OS concepts (contd.)

- Concurrency – The different branches are being allocated faculty time in parallel.
- Deadlock handling – A semaphore algorithm has been designed to ensure that no deadlocks occur i.e. no two branches will be allocated the same faculty for a particular time slot.
- Starvation prevention – To ensure that one branch doesn’t use up long durations of time of a particular faculty, a quantum time splitter algorithm has been used which switches the allocation to another branch after the quantum time expires (in this case 1 hour of faculty time).

## Limitations and Future scope

Though easily modifiable, the set input parameters can be looked at as a constraint or limitation.

For future there is a scope of adding functionalities like classroom and lab allotment, having some flexibility with respect to faculty and guest lectures instead of the fixed 8 hour duration etc.

## References

BOOKS

Operating Systems: Internals and Design Principles - by William Stallings

LINKS

https://www.geeksforgeeks.org/python-writing-excel-file-using-openpyxl-module/

https://stackoverflow.com/questions/13381384/modify-an-existing-excel-file-using-openpyxl-in-python

https://www.lucidchart.com (for making flowcharts)

https://www.draw.io (for making flowcharts)