Software Requirements Specification

for

Time Table Generator, Release 1.0

Version 1.0 approved

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Revision History

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Date Reason For Changes

15/09/23 initial draft

Version 1.0 draft

1. Introduction

1.1 Purpose

This Software Requirements Specification (SRS) delineates the functional and non-functional prerequisites for the inaugural release (1.0) of the Time Table Generator. Its purpose is to serve as a guide for the project team responsible for executing and validating the system's proper operation. Unless stated otherwise, all requirements detailed in this document are classified as high-priority and are guaranteed to be included in release 1.0.

1.2 Project Scope and Product Features

The Time Table Generator will provide universities, schools a time table schedule that equally distributes the workload among the professors and avoid any clashes resulting in smooth functioning. A detailed project description is available in the Time Table generator and Scope Document [1]. The section in that document titled “Scope of Initial and Subsequent Releases” lists the features that are scheduled for full or partial implementation in this release.

1.3 References

1. Islam, T. , Shahriar, Z. , Perves, M. and Hasan, M. (2016) University Timetable Generator Using Tabu Search. *Journal of Computer and Communications*, **4**, 28-37.
doi: 10.4236/jcc.2016.416003.

2. Overall Description

2.1 Product Perspective

The Time Table Generator is a new system that replaces the current manual task of generating time tables for various task in schools and colleges and provides scalability. The context diagram in Figure 1 illustrates the external entities and system interfaces for release 1.0. The system is expected to evolve over several releases, ultimately connecting to the Internet ordering services for several local restaurants and to credit and debit card authorization services.

2.2 User Classes and Characteristics

Head of Department (HOD)

Role: The Head of Department is a senior faculty member with significant administrative responsibilities.

Characteristics:

- Holds authority to authorize major decisions related to course scheduling.
- Oversees and ensures department-specific constraints and requirements are met within the timetable.
- Reviews and approves/rejects schedule proposals.
- Provides final authorization for scheduling decisions within their department.

- Collaborates with other HODs and administrators to resolve scheduling conflicts.

Timetable Administrator

Role: The timetable administrator is responsible for managing the day-to-day scheduling tasks.

Characteristics:

- Assigns subjects and workload to each professor.
- Accommodates changes in the schedule, such as professor leave, and arranges substitute teachers.
- Ensures the timetable is updated and accurate.
- Collaborates closely with faculty members to address scheduling issues promptly.

Faculty Members

Role: Faculty members are responsible for teaching courses and require access to their class schedules.

Characteristics:

- Refer to the timetable to access information about the timing and location of their classes.

May request changes to their schedules through the timetable administrator.
Need timely updates on any schedule changes or classroom assignments.

Students

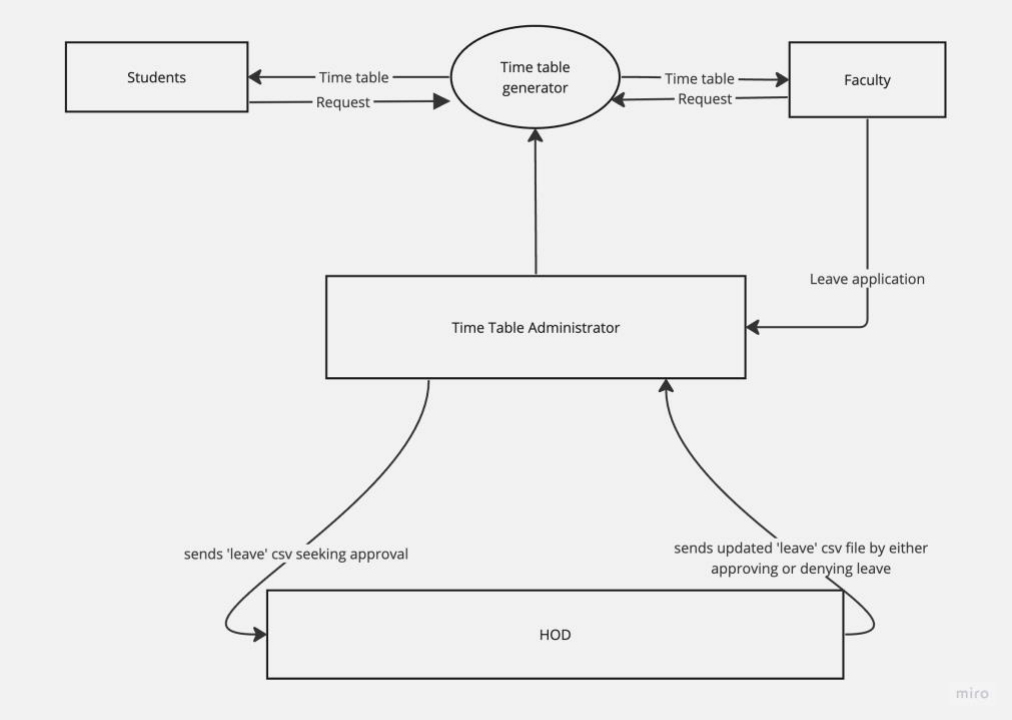
Role: Students rely on the timetable to plan their daily routines and attend classes.

Characteristics:

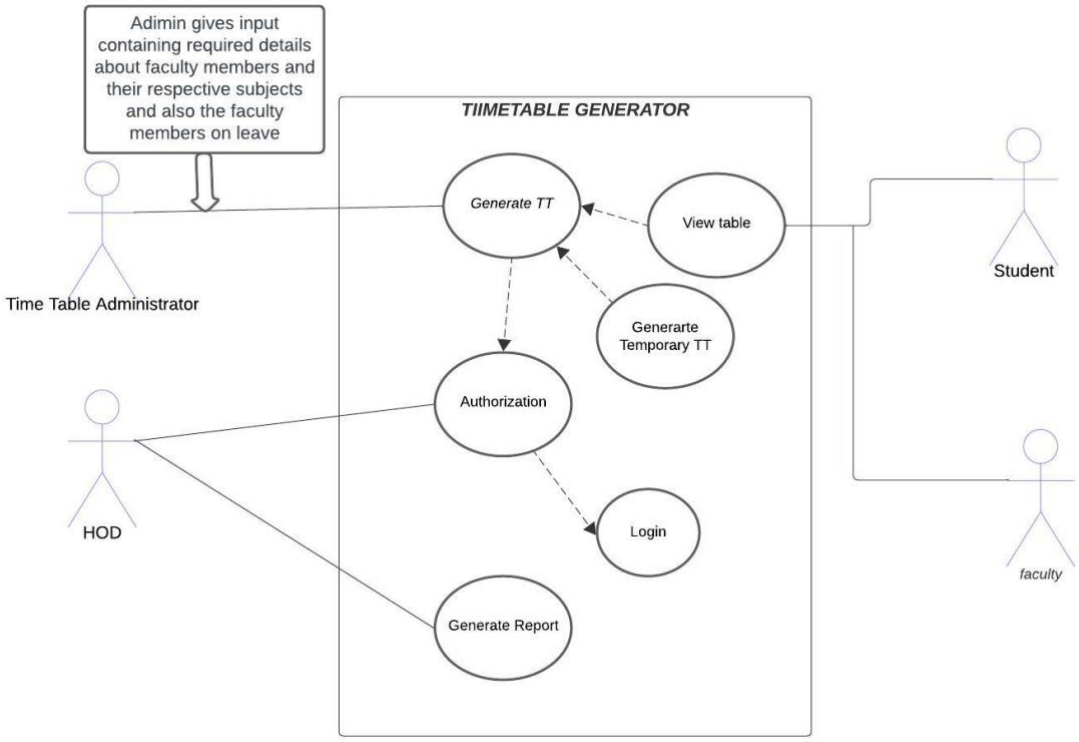
- Access the timetable to determine when and where their classes are scheduled.
- Limited to viewing the timetable for their specific class or group.
- May need to check for updates or announcements regarding class cancellations or room changes.

- Depend on the timetable for efficient time management.

Context diagram



Use case diagram



2.3 Operating environment

OE1 : User Hardware:

- Personal computer and laptop of the user.
- Must have enough disk space to run executables and download pdf reports.
- Users, including HODs, timetable administrators, faculty members, and students, will access the software from their laptops.

OE2 :

- The timetable generator will work on windows.

OE3 :

- In the user space, the student and faculty entities will have read-only access to the timetable, the timetable administrator will have both read and write access privileges and the Head of the department will have read, write and approve privileges.

2.4 Design and Implementation Constraints

CO1 :

- The developer side must contain C++ 17.

CO2 :

- The developer side must be windows system as the code is not platform independent.

CO3 :

- Educational institutions often have complex scheduling constraints, such as faculty preferences, section capacities.

2.5 User Documentation

- Student can easily view their time table from a csv file
- Faculty have a different view of the time table and can view their schedule from a csv file

2.6 Assumptions and Dependencies

AS1 : All faculty are expected to have an ideal workload of 20 hours per week. This can vary depending on whether the faculty decides to take extra classes with the approval of the head of the department.
AS2 : The HOD (head of the department) will solely be functional in the management aspect of the faculty and will not be taking any classes.
DP1 : The role of the HOD on the decision of leaves and other matters is final.

3. System Features

3.1 Generate Timetable

3.1.1 Description and Priority

This feature enables the creation of a timetable given a set of inputs such as the faculty names, faculty ID, set of subjects handled by each faculty, number of sections, leave status of faculty and a given workload constraint of 20 hours per faculty.
This is done ensuring that there are no clashes in the timetable.

Priority: Utmost priority is given to create a timetable with no clashes and complying with the workload constraints.

3.1.2 Stimulus/Response Sequences

Stimulus: Administrator gives inputs and initiates the timetable generation process.

Response: The system generates time table/class schedules and displays them for review.

Stimulus: Administrator gives the updated input with details of the teachers(and their subjects) who are on leave

Response: The software processes the provided leave details, temporarily adjusts the schedule to accommodate faculty leave, and ensures that affected courses are rescheduled or temporarily reassigned to substitute instructors.

3.1.3 Functional Requirements

- The system shall allow the Administrator to create a new academic timetable for the specified academic year.
- The system shall consider constraints and requirements approved by the Head of Department (HOD), including faculty availability and room availability.
- The system shall generate a feasible timetable, ensuring that it does not violate any constraints.
- The system shall optimize the timetable for efficiency, minimizing conflicts between classes

3.2 Authentication and Authorization of HOD

3.2.1 Description and priority

This feature is used to authenticate the request for leaves and to take the approval from the HOD on which faculty is approved for a leave if multiple requests arise.
Priority: High priority is given grant read and write access on the ‘leave’ CSV file by the HOD for approval

3.2.2 Stimulus/Response Sequences

Stimulus: Head of Department (HOD) logs in to approve course schedules.

Response: The system verifies the HOD's permissions, allowing schedule approval or rejection, with decisions recorded.

Stimulus: Head of Department (HOD) approves or rejects the time table.

Response: The system updates the time table or retains the old time table depending on the decision of the HOD

3.2.3 Functional Requirements

- The system shall empower the Head of Department (HOD) with the ability to approve or reject proposed changes to the academic timetable, ensuring accurate scheduling.
- All approved changes shall be promptly reflected in the academic timetable

3.3 Reporting and Analytics

3.3.1 Feature Description:

The Reporting and Analytics feature provides the HOD with the capability to generate customized reports from the academic timetable data. This feature allows the HOD to gain insights into class schedules and faculty assignments, aiding in academic planning and resource allocation.

Priority: Medium priority

3.3.2 Stimulus/Response sequences

Stimulus: The user selects the desired report type, such as a report of all classes scheduled for a particular day or time or a workload of a faculty members.

Response: The system dynamically generates the requested report, presenting it in a user-friendly format.

3.3.3 Functional Requirements

The system shall provide reports such as workload of faculty and classes scheduled for a particular day or time.

3.4 Viewing and Accessing Schedules

3.4.1 Feature Description:
Users can view their timetable for the current academic year.

Priority: High priority

3.4.2 Stimulus/Response sequences

Stimulus: Students request their class schedule for the current semester.

Response: The system retrieves and displays the student's personal class schedule with course details.

Stimulus: A faculty member requests access to their personal schedule.

Response: The system retrieves and displays the requested schedule for the faculty member, providing details such as class timings, course assignments, and room locations.

3.5.3 Functional Requirements

- The system shall allow the Head of Department (HOD), faculty members, and students to view the timetable.
- The timetable must be displayed in a clear and concise format, with easy-to-read labels.

4. External Interface Requirements

4.1 User Interfaces

- UI-1: The inputs given by the time table administrator is through a command line interface
- UI-2: The output is viewed by the students and faculty from a csv file

4.2 Hardware Interfaces

- Laptops through which students and faculty can view their respective schedules

4.3 Software Interfaces

- The inputs (semester-wise subjects , no. of hours of classes per day, teachers and the subjects they handle) given by the time table administrator are processed by the scheduling algorithm to provide a suitable time table.
- Once the time table is generated , it is stored in a csv file which can be viewed by faculty and users

4.4 Communications Interfaces

CI-1: On application of leave by faculty, the time table admin sends the ‘leave’ csv file to the HOD via email

CI-2: After updating the ‘leave’ csv file, the HOD sends it back to the time table administrator via email

5.Other non-functional requirements

5.1 Performance requirements

- Reliability: The timetable generated will have the workload constraints of all the faculty set to a maximum peak of 20 hours per week and ensures that there are no clashes between different periods belonging to the same teacher across different sections.
- Availability: The Timetable CSV file will be available to the student and faculty as a read only file. This also helps the end users (student and faculty) to view and plan their day accordingly.
- Fault Tolerance: In case of an unexpected failure of timetable generation the old timetable file will not be affected and will be retained as it is.
- Data Integrity : Data consistency is maintained by different access privileges for the various CSV files used. The ‘leave’ CSV file is abstracted from the student users. This ‘leave’ CSV file will be available to the timetable administrator and the HOD with them having read and write permissions.

5.2 Safety Requirements

No safety requirements have been identified.

5.3 Security Requirements

SE-1: The time table shall only be written by the time table administrator

SE-2: Any changes to the time table shall only take place after the approval of HOD

SE-3: The faculty and student shall only be given read access to the time table inorder to maintain consistency and avoid any clashes

5.4 Software Quality Attributes

Usability - The time table generator is very user-friendly and intuitive for various user classes, including administrators, faculty, and students.

Reliability - Reliability ensures that the timetable generator consistently produces accurate and dependable schedules

Appendix A: Data Dictionary and Data Model

Input location = the time table administrator office

Teacher ID – ID number that uniquely identifies faculty members

Leave application - Time table administrator sends a leave csv file(teacher ID, teacher name, subject, Number of days of leave requested, leave status) to the HOD

Approval - HOD approves or rejects certain requests and sends the updated ‘leave’ csv file back to the Time Table administrator

Input instruction = It is a csv file which contains section ,subject 1,subject2…..subject n as its columns. It gives information about the teachers and the subjects they handle for a particular class

Sem- wise subjects - *List of the subjects of a semester (decided by the time table administrator)*

Number of sections – decided by the time table administrator

Time table - time table generated by the T.T generator (stored in csv file)

APPENDIX B