Software Requirements

Specification

for

NBA Attainment System

Prepared by

**Neha Jaju (43222), Shyamal Khachane (43225), Manvi Pandya (43233) ,
Gauri Nandkhedkar (43236), Neelanjney Pilarisetty (43237)**

Pune Institute of Computer Technology

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1.Introduction

1.1 Purpose

The purpose is to reduce the overhead of storage and manual calculation of attainment using software program (eg. Software program like excel sheet) and hence create an efficient web application which accepts required inputs and generates attainment wise reports for each course.

1.2 Document Conventions

CO	Course Outcome
PO	Program Outcome
NBA	National Board of Accreditation
HTTP	HyperText Transfer Protocol

1.3 Intended Audience and Reading Suggestions

This project is a prototype for the NBA Attainment calculation system and it is restricted within the college premises. This has been implemented under the guidance of college professors. This project is useful for the teachers as well as the higher authorities.

1.4 Product Scope

Teachers use excel sheets to store the marks of students thereby setting targets and calculate the attainment manually. This web based application thus reduces the overhead of manual calculation and errors. A database server supports all the students in college as well as the marks secured by them in every subject. The web app also generates reports of attainment on the basis of class and subject. Also, further we can provide analysis for setting targets based on previous inputs. Above all, we hope to provide a comfortable, convenient and easy-to-use application for teachers along with the best functioning.

1.5 References

[1] A Simplified approach to measure Course Outcomes and Program Outcomes for accreditation of Engineering Institutes.
[2] Measuring Attainment of Course Outcomes and Program Outcomes – A Simplified Approach as per Self-Assessment Report - June 2015, IOSR Journal of Research & Method in Education (IOSR-JRME) .

2. Overall Description

2.1 Product Perspective

Course Outcomes (CO) : They are the resultant knowledge skills the student acquires at the end of a course.
Program Outcomes (PO) : As stated by NBA, represent the knowledge, skills and attitudes the students should have at the end of a four year engineering program in India.

Attainment refers to how much of the target is actually achieved in the range of 0 - 1

1. For every course, mapping of CO-PO is performed which infers to which CO maps to which PO and on what level (Levels are represented as 0,1,2,3 where 0 represents no mapping).
2. The target percentage of students achieving passed class, first class and distinction is set for Unit test 1, Unit test 2, SPPU.
3. Each question in a test is based on a CO . The marks of students are segregated as per CO's . The number of students achieving actual marks for each level is calculated.

    Calculations :
    Level 1 : Number of students scoring marks > 40%
    Level 2 : Number of students scoring marks > 60%
    Level 3 : Number of students scoring marks > 66%

4. Compare the actual and targeted results (%attainment=actual/target). Now map the percentage attainment between 0 and 1.

Calculations :

Attainment through University Examination

Attainment Level Targets

UA_AT_L1	% students scoring more than 40% in a specified course in SPPU exam.
UA_AT_L2	% students scoring more than 60% in a specified course in SPPU exam.
UA_AT_L3	% students scoring more than 66% in a specified course in SPPU exam.

Actual Attainment Achieved

UA_AC_AT_L1	Actual percentage of students scored more than 40% in a specified course.
UA_AC_AT_L2	Actual percentage of students scored more than 60% in a specified course.
UA_AC_AT_L3	Actual percentage of students scored more than 66% in a specified course.

$$UA\_CO\_AT = \frac{\dfrac{UA\_AC\_AT\_L1}{UA\_AT\_L1}*1 \quad \dfrac{UA\_AC\_AT\_L2}{UA\_AT\_L2}*2 \quad \dfrac{UA\_AC\_AT\_L3}{UA\_AT\_L3}*3}{6}$$

Attainment through Mid Term Assessments (Unit test)

Attainment Level Targets

MT_AT_L1	% students scoring more than 40% in a specified course in Unit test/ Assignments/ Lab
MT_AT_L2	% students scoring more than 60% in specified courses in Unit test/ Assignments/ Lab.
MT_AT_L3	% students scoring more than 66% in a specified course in Unit test/ Assignments/ Lab.

Actual Attainment Achieved

MT_AC_AT_L1	Actual percentage of students scored more than 40% in a specified course in Unit test/ Assignments/ Lab.
MT_AC_AT_L2	Actual percentage of students scored more than 60% in a specified course in Unit test/ Assignments/ Lab.

MT_AC_AT_L3	Actual percentage of students scored more than 66% in a specified course in Unit test/ Assignments/ Lab.

$$\text{MT\_CO\_AT} = \frac{\dfrac{MT\_AC\_AT\_L1}{MT\_AT\_L1}*1 \quad \dfrac{MT\_AC\_AT\_L2}{MT\_AT\_L2}*2 \quad \dfrac{MT\_AC\_AT\_L3}{MT\_AT\_L3}*3}{6}$$

Course Outcome Assessment Scheme:

Sr. No.	Assessment	Weightage	Attainment
1	University Examination(All Phases) UAL	70%	UA_CO_AT
2	Mid Term/Institute Level Unit Test I ,II	30%	MT_CO_AT

CO_AT=0.70*UA_CO_AT + 0.30* MT_CO_AT

2.2 Product Functions

1. Display of the course outcomes for each course for each class and for each year (SE TE BE).
2. Display of Program Outcomes.
3. CO-PO mapping with update facility and input validations.
4. Flexibility in setting test (Input of user includes number of questions and number of sub questions in each question.) with an updated facility.
5. Entry of marks according to the test set with update facility. (Data can be imported from csv or excel)
6. A proper course wise report.(Can be downloaded as a pdf)

2.3 User Classes and Characteristics

Teachers :
1. Enter Marks of unit test based on CO.
2. Download report (assigned subject and class only).

Subject Coordinator :
1. Enter Marks of unit test based on CO.
2. Enter CO-PO Mapping.
3. Download report (subject wise for each class).

Head of Department :
   Download the final report (wrt class , subject , student , teacher).

Admin : Keep regular backups of data and handle all application generated data.

The following are the main features that are included :

1. There are different access rights for Admin , Teachers , subject coordinator and HoD. Subject Coordinator can also login as a teacher
2. Subject coordinator can alter the CO-PO mapping.
3. Provides flexibility for teachers to set tests based on CO.
4. Data can be imported from Excel Sheets and CSV files.
5. Report is generated for each class and for each subject.
6. The Report can be downloaded as pdf.

Use Case Diagram :
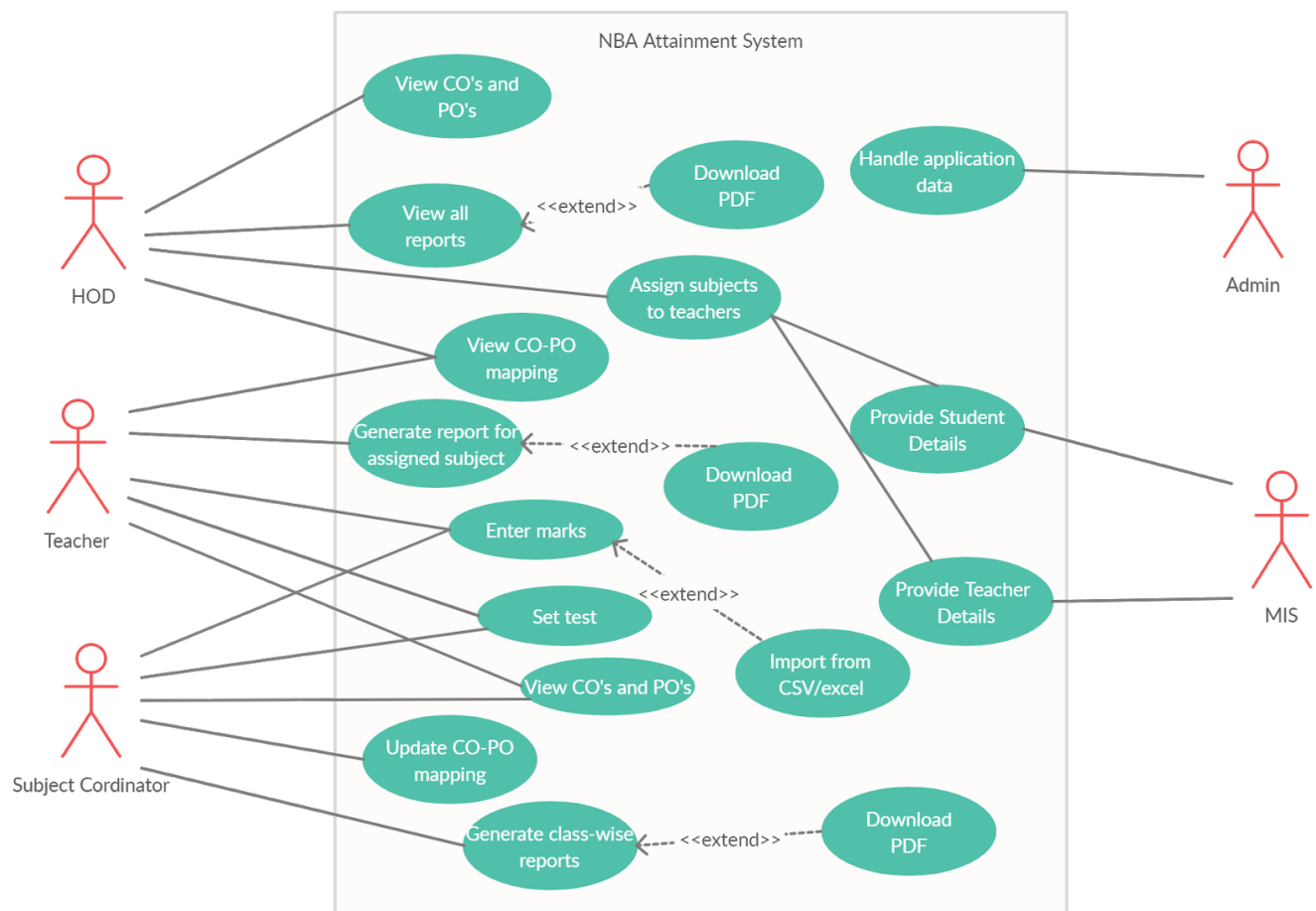
Class Diagram:
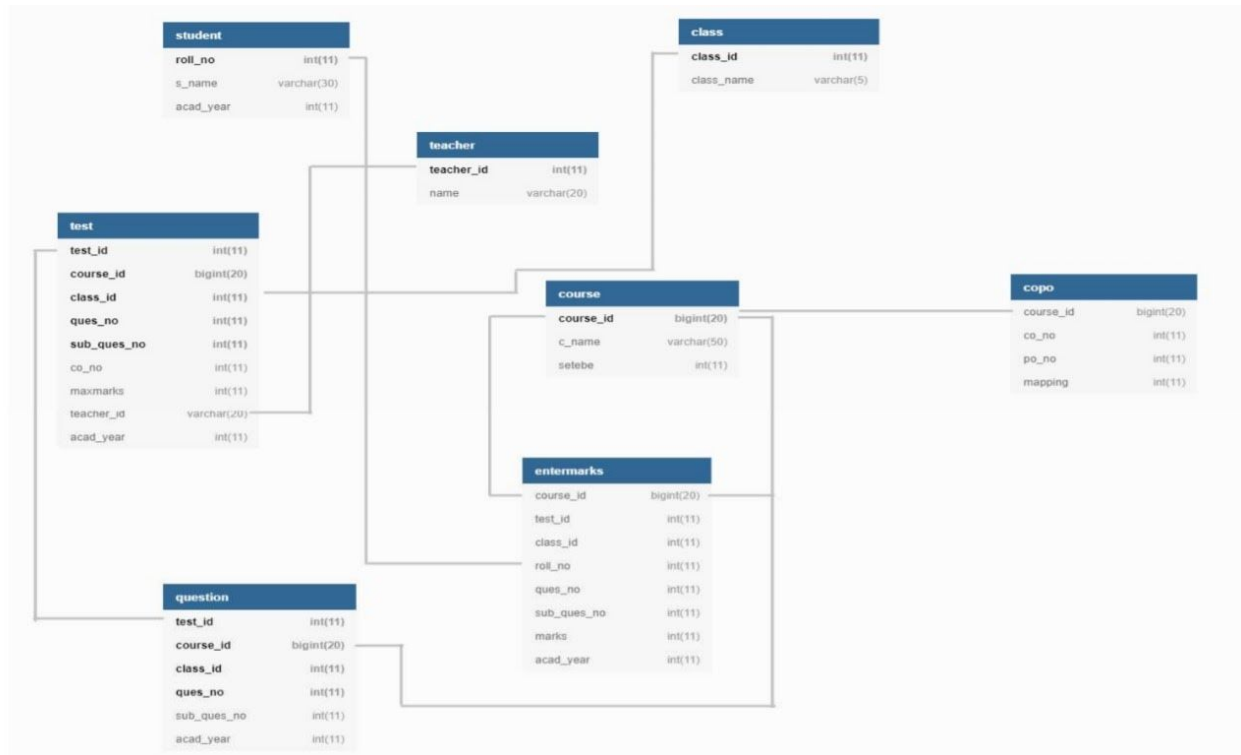
2.4 Operating Environment

1. Operating system: Windows / Linux .
2. Web Browser : Any (Chrome , Firefox)
3. Database: MySql
4. Connection : JDBC
5. Server : Tomcat (v5.0)
6. IDE : Eclipse
7. Technologies : Java / JSP

2.5 Design and Implementation Constraints

2.6 User Documentation

2.7 Assumptions and Dependencies

The data (marks of students) that is inserted in the database should be correct. If the input is wrong, all further procedures will be wrong.

3. External Interface Requirements

3.1 User Interfaces

The application is very user friendly and uses a GUI interface implemented in HTML and Bootstrap to communicate with the user. Various features are self – explanatory. Forms are easy to fill in and components can be updated very easily through a normal update button with confirmation dialog boxes which will   eventually   prevent   errors.   The application includes hints to give a brief description of the particular input Field. Proper validations prevent the user from performing   errors. Proper positioning of dashboard, home button and sign out options enable a user-friendly interface.

3.2 Hardware Interfaces

No hardware interfaces have been identified.

3.3 Software Interfaces

1. Operating system: Windows / Linux .
2. Web Browser : Any (Chrome , Firefox)
3. Database: MySql (v. 1.2.12)
4. Connection : JDBC
5. Server : Tomcat (v5.0)

3.4 Communications Interfaces

Support for all web browsers which eventually use HTTP.

4. System Features

Use case name	1. Display CO's and PO's 2. View / Update CO-PO mapping
Actors	Teachers, Subject Coordinator , HoD
Description	1. The course outcomes and program outcomes will be displayed for the reference of authority. 2. Facility of referring CO-PO mapping and also update it for some authorities.
Precondition	The user should be logged in , in the system as a teacher subject coordinator or HoD.
Flow	<u>Teacher</u> 1. The teacher can refer the list of CO's and PO's either to check the CO-PO mapping or to set test. 2. View CO-PO mapping for assigned subject. <u>Subject Coordinator</u> 1. The coordinator can refer the list of CO's and PO's either to check/update the CO-PO mapping or to set test. 2. View and update CO-PO mapping for assigned subject. <u>HoD</u> 1. Refer the list of CO's and PO's. 2. View the CO-PO mapping for any subject.
Exceptions	If Subject Coordinator is logged in as teacher, then they can't update CO-PO mapping.
Validations	The CO-PO mapping is represented in levels of 1 , 2 , 3 or no mapping at all. So the user must either any one of the set { 1 , 2 , 3 , '-' } If anything other than this is entered, the system will raise error.

Use case name	1. Set test for particular subject 2. Enter marks obtained by each student for the test.
Actors	Teacher , Subject Coordinator
Description	A test is set referring to the CO's of the respective subject. Test can be set flexibly such that each sub question shouldn't necessarily be mapped to CO of the question. The marks obtained for a particular test can be given to the system through an interface for further processing.
Precondition	The user should be logged in , in the system as a teacher or subject coordinator.
Flow	<u>Teacher</u> 1. The teacher selects the option of set test. The subject will be automatically chosen from the login information of the teacher. The teacher will then choose the skeleton of the test which includes information such as total number of questions , no of sub questions in each question and the CO upon which the question is based. 2. After the test is created , similar page for entering marks achieved is created dynamically. The teacher enters the marks as per respective question and sub question. The marks can be imported from excel sheets or csv file. <u>Subject Coordinator</u> 1. The coordinator selects the option of set test. The subject will be automatically chosen from the login information of the coordinator. The coordinator will then choose the skeleton of the test which includes information such as total number of questions , no of sub questions in each question and the CO upon which the question is based. 2. After the test is created , similar page for entering marks achieved is created dynamically. The coordinator enters the marks as per respective question and sub question. The marks can be imported from excel sheets or csv file.
Assumptions	The marks of students are properly entered or imported.
Validations	If a student is absent for the test , no record of his marks would be present. This is because we need to find out how many students were absent and how many of them scored 0. The marks entry for each question and subquestion is checked to ensure they lie between appropriate range. If not , system raises error

Use case name	Generate attainment report wrt teacher , class and subject
Actors	Teachers, Subject Coordinator , HoD
Description	The main focus is the calculation of attainment. It can be better displayed in the form of reports. Subject Report : Attainment for the subject for all classes. Class report : Attainment report for each class and each subject. Teacher : Reports of a particular teacher based on target and achieved attainment for all assigned subjects and classes.
Precondition	The user should be logged in , in the system as a teacher subject coordinator or HoD.

Flow	Teacher
	  1. The teacher can generate and download reports for assigned subjects and class. The report will contain all the target and achieved levelwise values.
	
	Subject Coordinator
	  1. The coordinator can generate and download reports for assigned subjects and for all classes. The report will contain all the target and achieved levelwise values for
	  ~ each class separately for assigned subject
	  ~ all classes together
	
	HoD
	  1. The HoD can view and download report for all subjects and for all classes. The report will contain all the target and achieved levelwise values for :
	  ~ a particular subject and particular class.
	  ~ a particular subject and all classes
	  ~ a particular class and all subjects.

Exceptions	The attainment calculation involves the actual number of present students. Hence , marks od absent students are indicated by '-' Marks of present students scoring 0 are filled in as 0.

4.1 Report Generation

4.1.1   Description and Priority

This is a high priority feature which benefits the teachers to gain an overall idea on the attainment. Also, the report contains attainment of previous years , thereby comparing progress.

4.1.2   Stimulus/Response Sequences

Teacher will set the test and enter marks for each student for each test.
Teachers will also enter the target for each subject class wise.

4.1.3   Functional Requirements

The web application handles invalid input by firing triggers thus generating an error dialogue box. (validation : Marks obtained < Total marks for a test)

4.2 CO-PO Mapping Tables

4.2.1   Description and Priority

This is a medium priority feature which benefits the teachers to keep a track on the mapping. Also, the subject coordinator has the ability to update the mapping. The CO-PO mapping will be displayed for each course subject.

4.2.2   Stimulus/Response Sequences

Teacher will set the test and enter marks for each student.
Teachers will also enter the target for each subject class wise.

4.2.3   Functional Requirements

The web application handles invalid input by firing triggers thus generating an error dialogue box. (example : if the co-po mapping values goes above 3 or below 0)

5. Other Nonfunctional Requirements

5.1 Performance Requirements

The steps involved to perform the implementation of NBA Attainment are as listed below :

A) E-R DIAGRAM

The E-R Diagram constitutes a technique for representing the logical structure of a database in a pictorial manner. This analysis is then used to organize data as a relation, normalizing relation and finally obtaining a relation database.

- **ENTITIES:** Which specify distinct real-world items in an application.
- **PROPERTIES/ATTRIBUTES:** Which specify properties of an entity and relationships.
- **RELATIONSHIPS:** Which connect entities and represent meaningful dependencies between them.
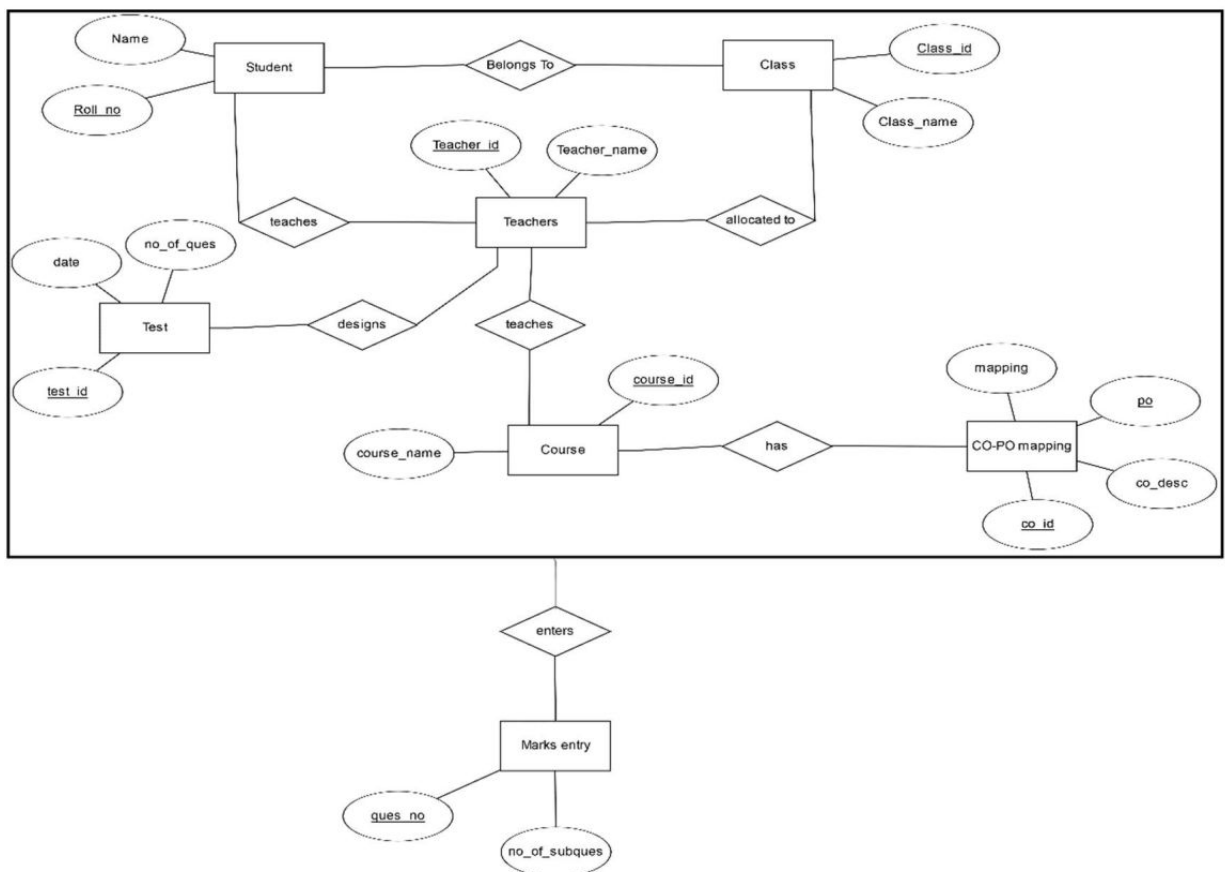
B) NORMALIZATION:

The basic objective of normalization is to reduce redundancy which means that information is to be stored only once. Storing information several times leads to wastage of storage space and increase in the total size of the data stored.

If a database is not properly designed it can give rise to modification anomalies. Modification anomalies arise when data is added to, changed or deleted from a database table. Similarly, in traditional databases as well as improperly designed relational databases, data redundancy can be a problem. These can be eliminated by normalizing a database.

Normalization is the process of breaking down a table into smaller tables. So that each table deals with a single theme. There are three different kinds of modifications of anomalies and formulated the first, second and third normal forms (3NF) is considered sufficient for most practical purposes. It should be considered only after a thorough analysis and complete understanding of its implications.

5.2 Safety Requirements

If there is extensive damage to a wide portion of the database due to a catastrophic failure, such as a disk crash, the recovery method restores a past copy of the database.

5.3 Security Requirements

Security systems need database storage just like many other applications. However, the special requirements in terms of security involve the access rights provided to the various stakeholders.The student must be provided with access that allows them to view data specific for their profile. And the same applies to the teachers too.

5.4 Software Quality Attributes

- **Availability :** The data should be available on any specified date and at any specified time according to the user.
- **Correctness :** The records should have all the correct data and there should be no erroneous data available.
- **Maintainability :** The maintaness of the data should also be taken into account.
- **Usability :** The data available should satisfy the needs of the maximum number of users.