

STUDENT PERFORMANCE MONITORING SYSTEM

Project Report

Section: 1

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CHAPTER 1: INTRODUCTION

SECTION 1.1: BACKGROUND OF THE ORGANIZATION

Independent University, Bangladesh (IUB) is one of the leading private university in Bangladesh. It was established in 1993. It focuses explicitly on Research and Global partnerships. Main mission of IUBs is to achieve the goals of higher education and of sustainable economic growth in the country through a two-way relationship between community and university. Its goals are to produce graduates of international standards within the local environment, with knowledge and relevant skills so that it can provide leadership in enterprise, public service, and welfare, encourage and support useful research, create knowledge, and provide further learning opportunities.

Currently IUB have six academic schools:

- School of Business
- School of Engineering and Computer Science
- School of Environmental Sciences and Management
- School of Liberal Arts and Social Sciences
- School of Life Sciences
- School of Public Health

IUB is rapidly expanding its portfolio and is in the process of introducing Architecture and Biotechnology. The University curriculum and course of study are progressively revised and adjusted based on their relevance to national needs and the global market demand. [1]

SECTION 1.2: BACKGROUND OF THE PROJECT

The Student Performance Monitoring System helps assessing necessary information to help students, faculties, administrators, and policy makers. It can be used to evaluate, and analysis the CO's and mapped PLOs achieved by a student for his/her enrolled courses. It will also help to analyse the enrolment process and student progress for faculties, deans, heads, and VC.

SECTION 1.3: OBJECTIVES OF THE PROJECT

- To analyse the enrolment procedure and enrolment status of a student.
- To help the higher authorities such as VC, Dean or department head to understand and assess student progress.

- To provide insight into what students are learning in relation to the big ideas of the courses and the program they aim to complete.
- To automate the process of monitoring student performance so as to reduce the manual processing involved in it.
- To analyse how student populations are learning inside of their programs so that the departments can focus more strategically on equity and success.

SECTION 1.4: SCOPE OF THE PROJECT

Using the basis of the existing system, we must update the system so that it is more user friendly and more helpful and more effective than it is now. The proposed system would provide us automatic insights on the enrolment trends, evaluate a student progress and store the record of a student's achieved CO and PLO's. The instructors, VC, dean, or department heads can also analyse and check a student's progress of any course or program's overall status. As most of the tasks mentioned above are done manually this day, it will be very helpful for the students, faculties, deans, or heads. We tried to implement this project for IUB, but it can be also used by UGC in the upcoming days with some updates and modification to get notified about all the universities.

CHAPTER 2: REQUIREMENT ANALYSIS

SECTION 2.1: RICH PICTURE (AS IS)

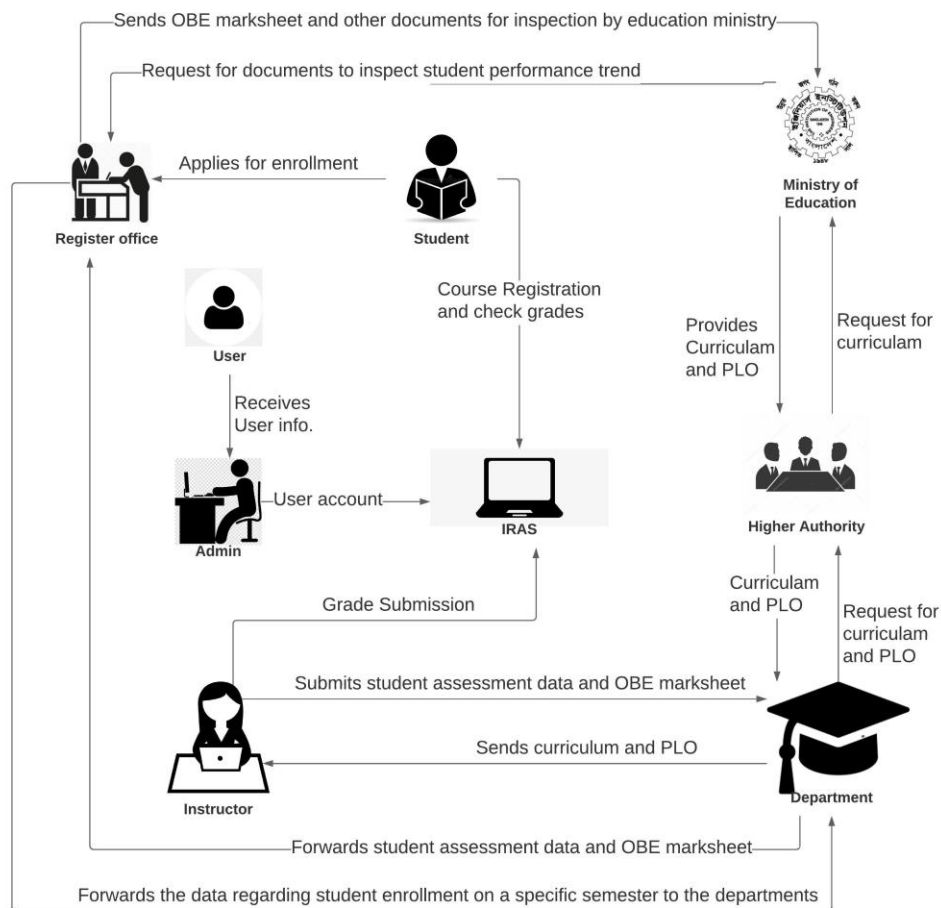


Figure 1: Rich Picture (AS-IS)

SECTION 2.2: PROCESSES ALONG WITH SIX SYSTEM ELEMENTS (AS-IS):

Process Name	Human	Non-Computing Hardware	Computing Hardware	Software	Database	Network & Communications
1) Student enrolment data record	<p>Student:</p> <p>1) Enrols in a certain degree program.</p> <p>2) Provides enrolment data to the register office</p> <p>Registrar Office:</p> <p>1) Collects the total number of students enrolment data in a certain semester for each degree program</p> <p>2) Keeps a copy of</p>	<p>Pen & Paper:</p> <p>Students may use to provide the enrolment information manually</p>	<p>Computer:</p> <p>Used for collecting the data and storing the record</p>	<p>MS excel:</p> <p>Used to record the data</p>	<p>The Department records:</p> <p>1) Register office collects the data and stores in the database</p> <p>2) Data is kept in Department records</p>	<p>Internet :</p> <p>Used for collecting the data and the Department can receive the data by email.</p>

	<p>the data and forwards the data regarding total number of students enrolment in a certain degree program on a specific semester to the specific departments</p> <p>Departments:</p> <p>1) Receives the total number of students enrolment on a specific semester from the registrar office</p>					
2) Higher authority collects PLOs from The Ministry of Education	<p><i>The Ministry of Education:</i></p> <p>1) Provides PLOs and curriculum to Higher authority</p> <p>Higher Authority:</p>	<p><i>Paper:</i></p> <p>The Ministry of Education may provide hardcopies of the PLOs and curriculum</p>	<p><i>Printer:</i></p> <p>To print the PLO and curriculum</p> <p><i>Computer:</i></p> <p>To create and send the</p>	<p><i>Microsoft Office:</i></p> <p>Used to edit or update the curriculum file.</p> <p><i>Gmail:</i></p> <p>Used for communication between the Ministry of Education,</p>	<p><i>Database:</i></p> <p>To store the PLO'S</p>	<p><i>Internet:</i></p> <p>Used by the Higher Authority to communicate with the Ministry of Education by emails</p>

	<p>1) Request to provide PLOs and curriculum</p> <p>2) Receives the curriculum and PLOs under the OBE model for each program from The Ministry of Education</p> <p>3)Sends the new curriculum and PLOs to the specific departments</p> <p><i>Department:</i></p> <p>1) Receives the curriculum and PLOs</p> <p>2) Provides Curriculum and PLO to the instructors to design CO and assessment data</p> <p><i>Instructor:</i></p>		curriculum and PLOs	Higher Authority, Departments and instructors		
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	1) Receives the course curriculum and PLO from the specific department					
3) Mapping of COs with PLOs by Instructor	<p>Instructor:</p> <p>1) List the COs on the basis of course content</p> <p>2) Maps course content to CO.</p> <p>3) Maps COs with the corresponding PLOs</p>	<p>Paper:</p> <p>To print out the mapped COs if needed</p>	<p>Computer:</p> <p>Used to edit the CO's Excel file.</p> <p>Printer:</p> <p>Used to print out the COs for hardcopy storage backup</p>	<p>Microsoft Excel:</p> <p>Used to store the mapped COs</p>	<p>Database:</p> <p>Student grade information are stored in the IRAS database</p> <p>Documents are stored in department storage</p>	<p>Internet:</p> <p>The Internet is used to communicate with IRAS to store final grades of students</p>
4) Record student assessment data	<p>Instructor:</p> <p>1) Take quizzes and exams and assign project work and assignments throughout the semester to the students.</p> <p>2) Records marks for each specific</p>	<p>Pen and Papers:</p> <p>Are used to record assessment marks</p>	<p>Computer:</p> <p>Is used to create soft copies of the data</p>	<p>Microsoft Excel:</p> <p>Assessments are recorded in the excel sheet.</p> <p>Upload students' final grades into IRAS</p>	<p>Database:</p> <p>Student grade information are stored in the IRAS database</p> <p>Documents are stored in department storage</p>	<p>Internet:</p> <p>The Internet is used to communicate with IRAS to store final grades of students</p>

<p>question achieve by the students throughout the semester for every exam on softcopies and hardcopies.</p> <p>3) Calculate total marks of quizzes, assignments and midterm and final exams</p> <p>4) Store the total marks achieved by each student in a specific course in to marksheet</p> <p>5) Assign grades to the students</p> <p>6) Send a copy of the marksheet (assessment data) to the Department</p> <p><i>Department:</i></p> <p>1) Receives assessment data of student for a specific</p>						
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	course from the instructor					
5) Create OBE Marksheet & Course Assessment Report	<p>Instructor:</p> <p>1) Evaluate marks achieved by the students for each question and other assessment mapped to CO. Thus calculate the total marks received for each CO.</p> <p>2) Calculates CO percentage. If greater than (For some special cases) or equal to 40% (in most cases) CO's then it is considered to be achieved, a student passes that certain CO otherwise fails.</p> <p>3) Record the information by</p>	<p>Pen and paper:</p> <p>OBE marksheet stored in hardcopy. Additional markings may be made to further separate between students</p>	<p>Computer:</p> <p>is used to make softcopies of the OBE Marksheet and Course Assessment Reports.</p> <p>Printer is used to print hardcopies of final versions of the OBE Marksheets and Course Assessment Reports.</p>	<p>Excel sheets:</p> <p>Instructors use automation to calculate the student's success/failure in achieving PLOs.</p> <p>MS word : is used to make assessment report</p>	<p>Department storage:</p> <p>Records of students' assessment data and final grades will be saved</p> <p>Registrar office storage:</p> <p>OBE Marksheets, Course Assessment Reports and other documents submitted by the department is stored.</p>	<p>Internet:</p> <p>Google Sheets may be used for processing the OBE assessment data spreadsheet</p>

<p>designing a table containing marks of each question achieved by the student along with total mark of midterm and final exam and check how many students were able to receive a certain CO and PLO</p> <p>4) Make Course Assessment Report using Course Outline, Course Content and mapped COs with PLOs</p> <p>5) Submits OBE marksheet and course assessment report to the department</p> <p><i>Department:</i></p> <p>1) Receives the OBE Marksheet and Course Assessment</p>						
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	<p>Report from the instructor</p> <p>2) Stores the documents</p> <p>3) Forwards the OBE marksheet, Course Assessment Report and others to the Registrar's Office.</p> <p>Registrar's Office:</p> <p>Receives OBE marksheet, student assessment report form all the departments</p>					
6) Student performance trend inspection based on PLO, CO achievement By the Ministry of	<p>Registrar office:</p> <p>1) Gathers all OBE marksheets and assessment reports together</p> <p>2) Submits the</p>	<p>Paper:</p> <p>For Printing Hard copies of the reports</p>	<p>Computer:</p> <p>To generate reports</p> <p>Printer:</p>	<p>Microsoft Office:</p> <p>Used to make reports using Microsoft word and excel</p>	<p>Database:</p> <p>Store and access data related to the reports in the form of PDF, DOC, XLSX files etc.</p>	<p>Internet:</p> <p>Needed to access the web to send a copy of the reports as emails to their respective users</p>

Education	<p>documents to the education ministry as per request.</p> <p><i>Ministry of Education:</i></p> <p>1) Requests register office to provide student performance trend documents based on a particular department or the entire University</p> <p>2) Receives the documents and analyses them one by one.</p> <p>3) The ministry of Education provides feedback regarding their evaluation</p>		<p>To print hard copies of the reports to send them to their respective Department and to the Ministry of Education</p>			
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SECTION 2.3: PROCESS DIAGRAM (AS IS)

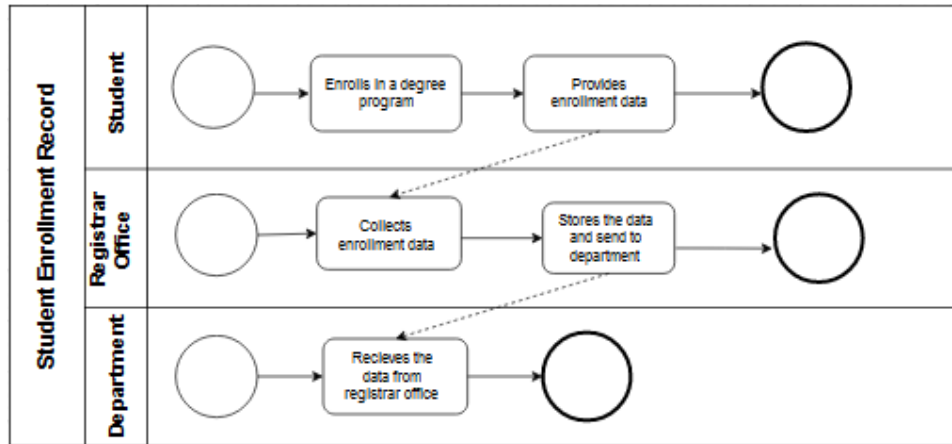


Figure 2: Student enrollment data record

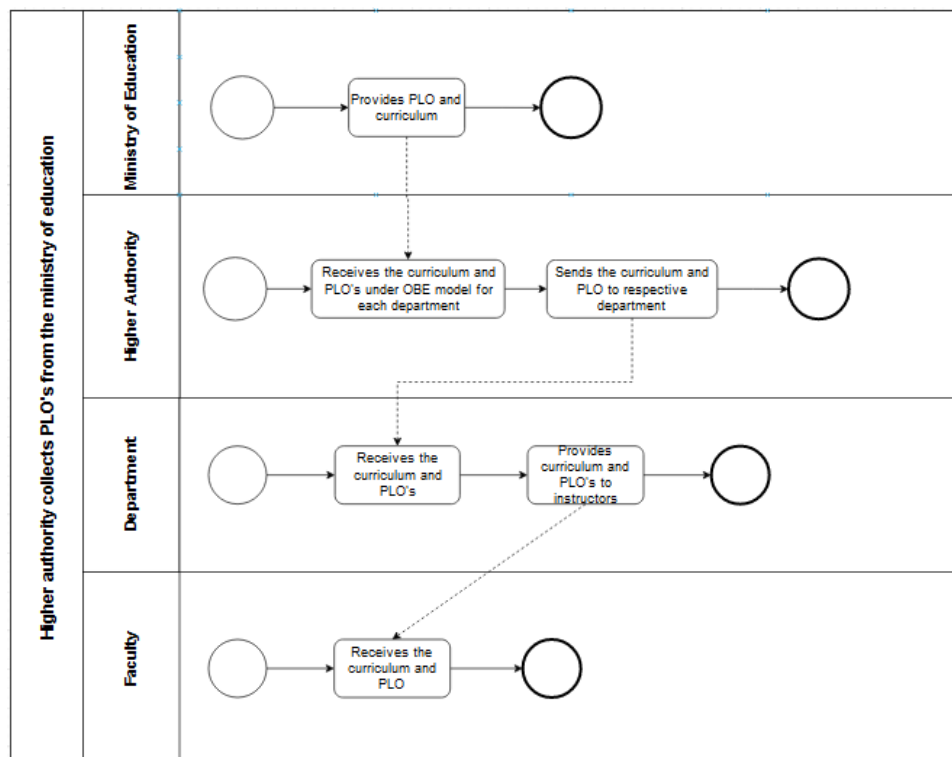


Figure 3: Higher authority collects PLOs from the ministry of education

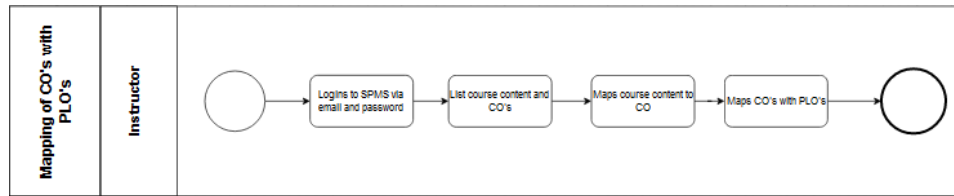


Figure 4: Mapping of COs with PLOs by instructor

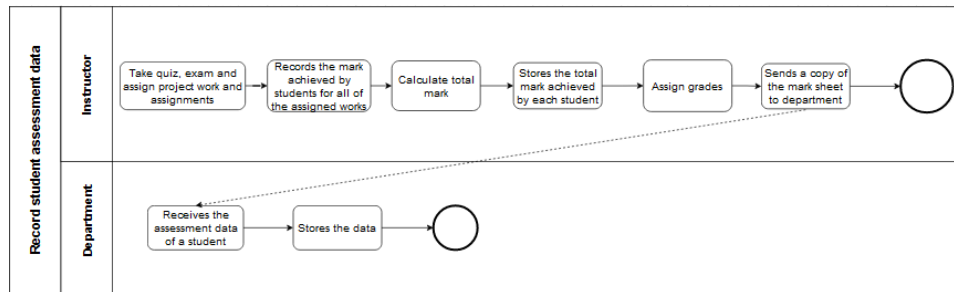


Figure 5: Record student assessment data

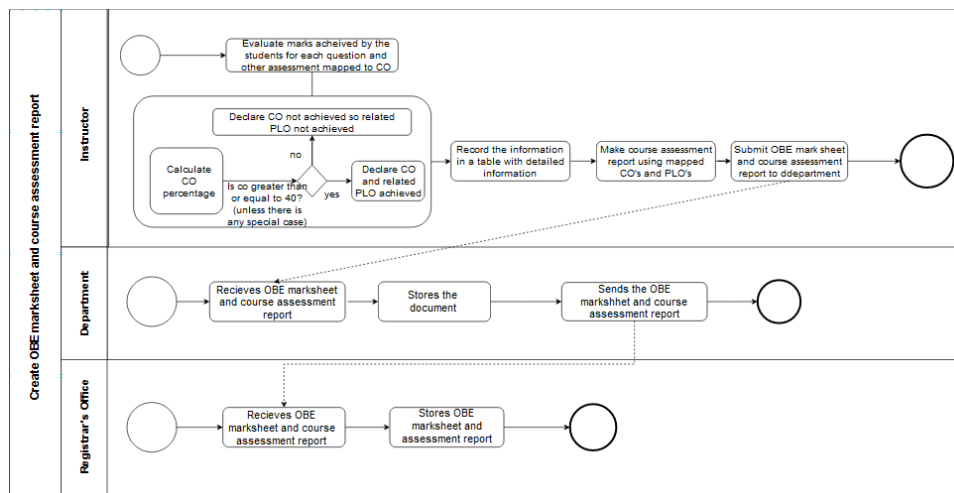


Figure 6: Create OBE marksheet and course assessment report

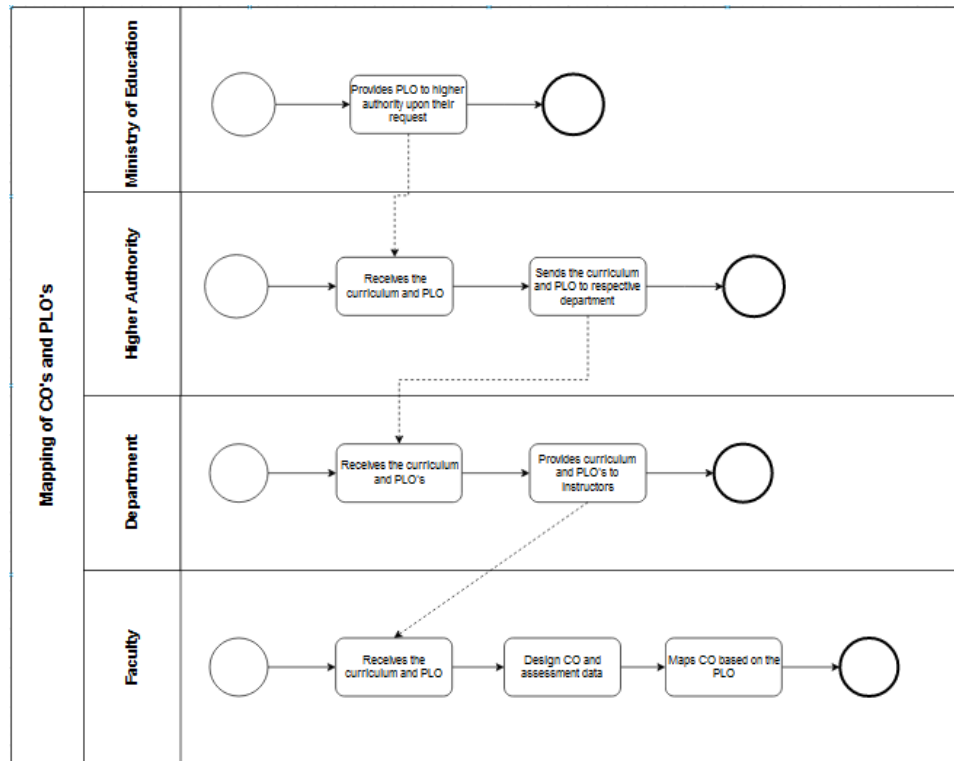


Figure 7: Student performance trend inspection based on PLO, CO achievement by the ministry of education

SECTION 2.4: PROBLEM ANALYSIS

Process Name	Stakeholders	Concerns	Analysis	Solution Proposed
1) Student enrollment record	1) Register Office 2) Department	1) There's no proper representation of student enrollment comparison data in the existing system 2) Loss or mix up of data 3) Risk of manual error	1) Forwarding the total number student enrollment records to different departments is an inefficient process. 2) Departments have to receive the data regarding total number student enrollment from the register office not directly from IRAS. 3) Register office might mix up the total number of student enrollment data while sending to different departments 4) If a higher authority or department wants to compare the enrollment data with another department they have to analyse the records on their own	In our SPMS, the register office will only input the data of the total number of student enrollment and the SPMS will automatically produce different graphical representation of the data which will show different comparison trends, e.g school-wise, department-wise, etc. Departments and Higher Authority will have direct access to the report.

2) Higher Authority collect PLOs from The Ministry of Education	I 1) The Ministry of Education 2) Higher Authority	1) Time consuming process 2) Loss of document 3) Inefficient process as the Higher Authority needs to forward the PLO to the departments and the department has to provide this to the instructor every time.	1) Higher Authority have to request and wait for the Ministry to provide curriculum and PLO 2) There is a risk of losing the mail/hard copy sent by the ministry 3) Higher Authority have to send the PLO and curriculum to every departments, misplacement and miscommunication can occur in this process 4) Departments have to forward the PLO and curriculum to every instructor. 5) Instructors have to wait for the department to send documents. Delay and problems occur in this process	Ministry of education can directly provide PLO into SPMS Instructor can receive the PLO directly from the SPMS
3) Mapping of PLO's & CO's	1) Instructor	1) Risk of manual error 2) Loss of data 3) Inefficient process	Instructors list the course content and COs . Maps the course content with COs and then maps the COs with the PLOs Several tasks are done by the Instructor which is very time consuming, high chance of manual error and loss of data may occur in this process	Instructor will just have to input the data and SPMS can automatically map the course content with CO and map CO with given PLO Which will can be later used to produce Assessment report and marksheets

4) Record of Student Assessment	1) Instructor 2) Department	1) High chance of manual error. 2) delays or loss of information and important data. 3) After receiving the documents from Instructors , storing them can be an insufficient process and hard work to manage. 4) Disorganized process .	1) Collecting all the data regarding student assessment and keeping record and finding the trend will extremely hard and lengthy process , chances of manual errors are high and the process will be inefficient 2) For departments storing the documents received from the instructor can be a difficult process to manage 3) Keeping track of all the soft copies and hard copies will take lots of time and it is a disorganised process	Faculty can input the student assessment information directly into SPMS and it will generate a proper report which can be viewed by the higher authority and departments etc

5) Create OBE Marksheet & Course Assessment Report	1) Instructor 2) Department 3) Register Office	1) Instructor manually creates the OBE marksheet and assessment report by using excel. 2) In the existing system there is no proper representation of assessment report 3) Time consuming process 4) here's high risk of losing or misplacing the data 5) Difficult to track the data.	1) Instructors calculates the marks and manually inputs the data in excel sheets which can cause manual error while formatting the columns and the risk of misplacings and losing the file is file 2) Sending the documents to the department could easily lead to confusion and loss of data 3) Storing softcopies and hardcopies can become extremely difficult to manage 4) It very difficult to track down a performance trend of a certain student or a specific department	Instructors will input data regarding student assessment and SPMS will automatically generate OBE marksheet and generate an assessment report as the table of mapped CO and PLO are already in the SPMS which will show the percentage of students with achieved COs and not achieved CO's in a graphical representation. Department can have a direct access to the system to check the assessment report
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6) Student Performance trend inspection	1) The Ministry of Education 2) Registration Office	1) The Ministry of Education and higher Authority will have to request the register office to view for a regular inspection and analyse the documents one by one manually. 2) The existing process of inspection is very disorderly 3) No proper representation of Performance trend school, course, department, instructor and student wise	Higher Authority have to request and wait for the ministry to provide curriculum and PLO there is a risk of losing the mail/hard copy sent by the ministry Higher Authority have to send the PLO and curriculum to every departments, misplacement and miscommunication can occur in this process Departments have to forward the PLO and curriculum to every instructor. Instructors have to wait for the department to send documents. Delay and problems occur in this process	Ministry of education can directly provide PLO into SPMS Instructor can receive the PLO directly from the SPMS Instructor can upload mapped CO to specific questions of specific exams taken as a table on directly the SPMS system Which will can be used to produce Assessment report and marksheets
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SECTION 2.5: RICH PICTURE (TO-BE):

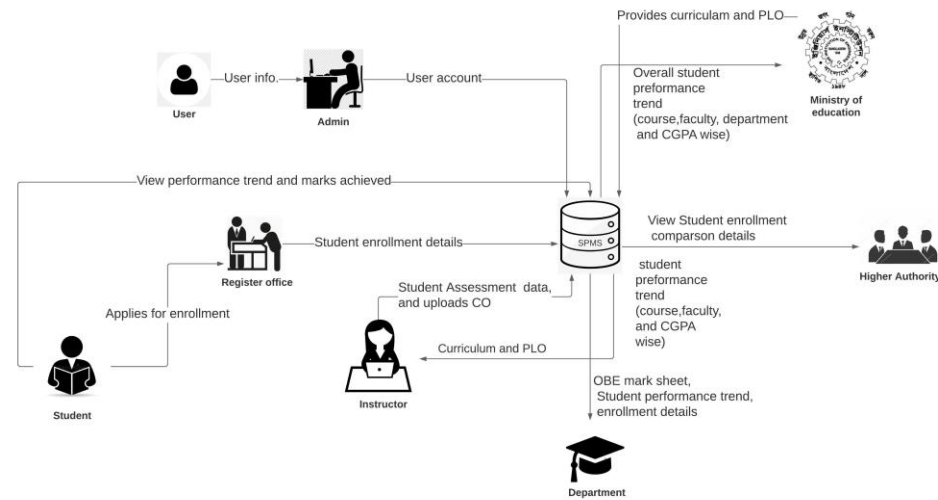


Figure 8: Rich Picture (TO-BE)

SECTION 2.6: PROCESSES ALONG WITH SIX ELEMENTS (TO-BE):

Process Name	Human	Non-Computing Hardware	Computing Hardware	Software	Database	Network & Communications
1) Student enrolment data record	Student:	Pen and paper: Students	Computer : Used for collecting the	SPMS: Registrar office provides data to the	SPMS Database: Student	Internet : The Internet is used to access SPMS as

	<p>1) Enrols in a certain degree program.</p> <p>2) Provides enrolment data to the register office</p> <p>Registrar Office:</p> <p>1) Collects the enrolment data from the student</p> <p>2) Uploads the data into the system</p> <p>Department:</p> <p>1) Logins to the system</p> <p>2) Clicks on "Enrolment details"</p> <p>3) Inserts categories such as : Department wise, school wise semester wise etc.</p>	may use provide the enrolment information manually	data and creating comparison report	software and the SPMS software uses the information to automatically produce different graphical representations of the data which will show different comparison trends, e.g school-wise, department-wise, etc.	enrolment information will be stored in SPMS database	it is a web based application
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	4) Views graphical representation of total number of students enrolment					
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2) Higher Authority Collect PLOs from The Ministry of Education	Ministry of Education: 1) Login to the SPMS dashboard 2) Clicks on the 'curriculum option' provided 3) Uploads the curriculum with defined PLOs under the OBE model for each program directly into the SPMS for the instructors and authority to view 4) Save the documents Instructor: 1) Login to the SPMS 2) Clicks on the 'curriculum'	None	Computer: Used for login into the SPMS and upload, view documents	SPMS: Provides interface for the Ministry of Education and Instructor to upload and view files	SPMS Database: To store the PLOS files	Internet: The Internet is used to access SPMS as it is a web-based application
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	option					
	3) Checks the course curriculum and PLO, reviews them					

3) Mapping of COs with PLOs	Instructor: 1) Logins to the SPMS dashboard via email and password. 2) Inputs data 3) Views graphical representation of student wise, course wise, department wise, degree program wise PLO achievement analysis .	None	Computer: Computer is used to access the SPMS	SPMS: COs are automatically mapped by using SPMS	SPMS Database: SPMS PLO and CO achieved by students in every course are stored in SPMS database and the report are generated and saved in SPM	Internet: SPMS must be connected with internet
4) Record student assessment data	Instructor: 1) Logins to the SPMS dashboard via email and password. 2) clicks on 'Assessment Records' 3) Choose 'Enter Assessment	None	Computer Is used for login, entering the data and view the data	SPMS: Provides interface for the instructor to provide assessment data	SPMS Database: Stores assessment data and And derives Student assessment information	Internet: The Internet is used to access SPMS as it is a web-based application

	Data' option					
	3) Inputs data such as- marks for each specific question achieve by the students throughout the semester for every exam					
	4) Saves the data					
	Department :					
	1) Logins to the system					
	2) Can view the assessment data by clicking 'View Assessment Data' option					

5) Create OBE Marksheet & Course Assessment Report	Instructor: 1) Logins to the SPMS 2) Select scope for data to view 3) SPMS will automatically generate different comparison view for the data	None	Computer: Used to access the SPMS And enter data	SPMS: will automatically generate different comparison view for the data	SPMS Database: For a certain course taken by the student Retrieve CO/PLO achievement data and tabulate them	Internet: The Internet is used to access SPMS as it is a web-based application
6) Student performance trend inspection	Instructor: 1) Login to the SPMS 2) Enters the data in the 'Assessment record' option Higher Authority: 1) Logins to the dashboard 2) Clicks on desired category	None	Computer: To enter data into SPMS and to view the performance trend of different category	SPMS: Instructors will input the student assessment data; SPMS will automatically produce different graphical representations of the data which will show different overall performance trends, e.g school-wise, department-wise, CGPA-wise etc.	SPMS Database: Stores assessment data and derives different graphical representations of the data	Internet: Needed to access the web to send a copy of the reports as emails to their respective users

	to inspect					
	3) Views the trend of student performance department wise					
	Ministry of Education:					
	1) Logins to the dashboard					
	2) Clicks on desired category to inspect					
	3) Views the trend of student					

SECTION 2.7: PROCESS DIAGRAM (TO-BE)

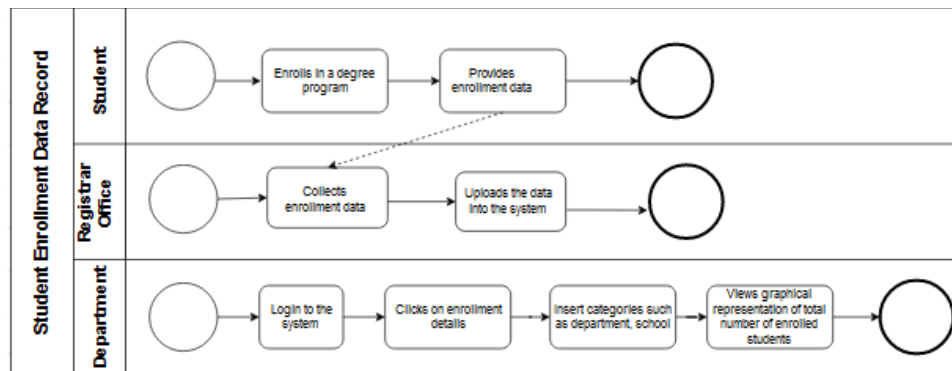


Figure 9: Process Diagram for Student Enrolment Data Records

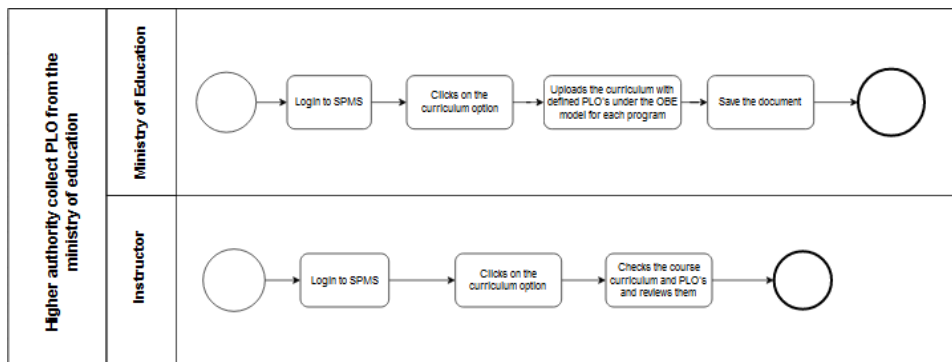


Figure 10: Higher authority collects PLOs from the ministry of education

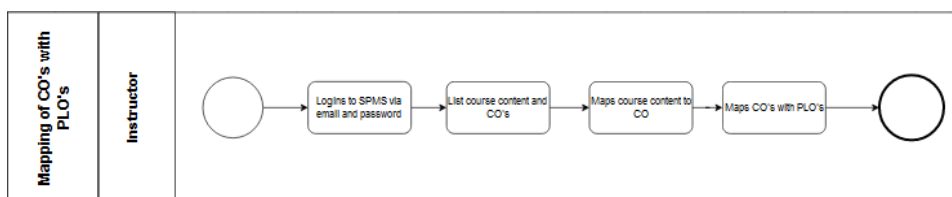


Figure 11: Mapping of COs with PLOs

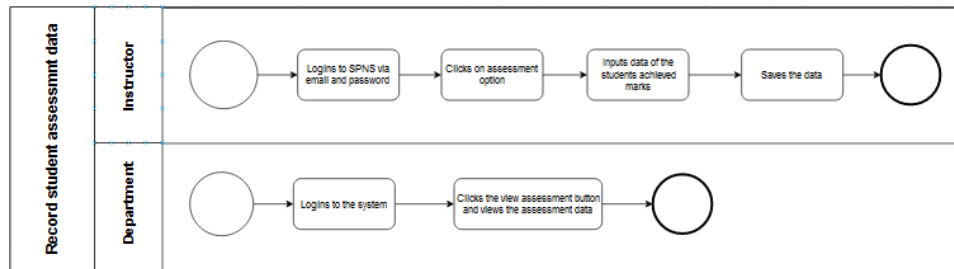


Figure 12: Record student assessment data

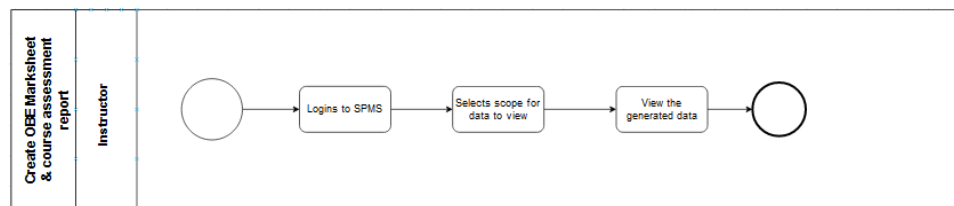


Figure 13: Create OBE marksheet and course assessment report

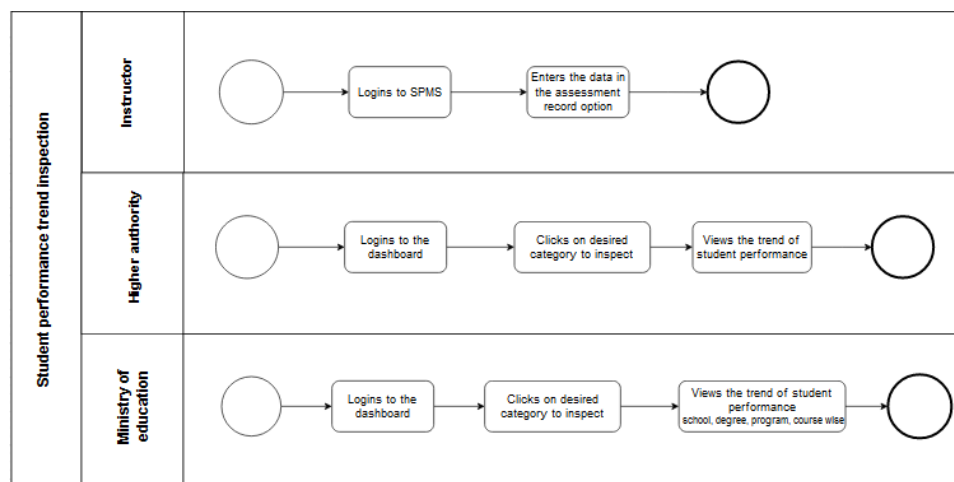


Figure 14: Student performance trend inspection

CHAPTER 3: LOGICAL SYSTEM DESIGN

SECTION 3.1: BUSINESS RULE

We are building a software which will increase efficiency in monitoring the student performance trend and analyse data regarding student enrolment for a university.

Users can login via userID and password to the system.

- 1) There are two types of employees, VC and Instructor. instructor types are further divided into deans and department heads and they all belong to the employee category
- 2) The university has several schools and each school is administered by the dean who may teach a class. Schools have many departments and each department is operated by one single school.
- 3) For each department there is a department head who is also an instructor. Departments have multiple instructors assigned to it and an instructor can belong to one specific department. Departments offer multiple degree programs but a degree program belongs to exactly one department. Each department has multiple students. Each student is associated with one single department
- 4) Under the OBE model for each degree program there will be a set of PLOs and each PLOs belongs to one specific degree program. For every individual degree program there are multiple enrolments. Degree program offered many courses, a certain course may belong to multiple degree Program
- 5) Students may enrol in more than one degree program (e.g., foundation, major, minor). But must belong to one specific department. Multiple enrolments occur for a certain degree program. Each enrolment is identified uniquely using Student ID and Degree Program ID
Students registers for multiple sections and each student gets evaluated for multiple course assessment
- 6) A semester has multiple courses offered but the offered courses will belong to only one semester every semester. For each course there may be several sections and to evaluate the students in each course, courses have multiple COs that are mapped with the PLOs of degree program. A PLO is mapped with multiple COs but a CO must be mapped with exactly one PLO
- 7) Section only exists if there's any course offered, if a course is removed then the sections of that course get deleted; sections must belong to only offered courses. A section consists of section numbers which works as a partial identifier, different courses may have sections of the same number assigned to them. So SemesterID and CourseID are required along with the

section number to identify a section

8) Instructors teach one or more courses which may belong to multiple sections. So, an Instructor teaches in multiple sections. Multiple sections contain multiple students for every course in the sections there will have multiple course assessments,

9) There are multiple course assessments under one CO but one single course assessment may be mapped with one CO. Each course assessment has multiple evaluations but an evaluation is done for exactly one course assessment.

10) Evaluations are identified uniquely using Student and Course Assessment ID and evaluation also has total marks obtained by the student in a course assessment.

11) Instructor marks many evaluations and one single evaluation will be marked by one instructor

SECTION 3.2: ERD

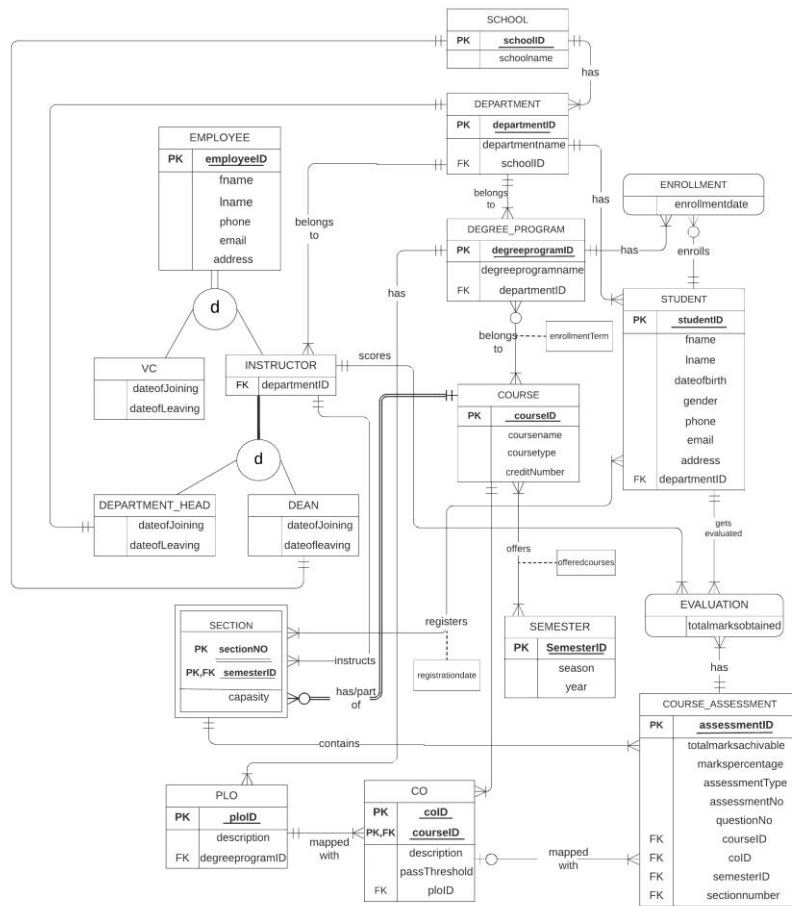


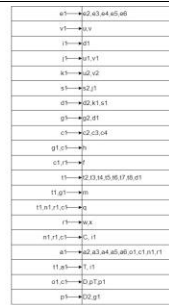
Figure 15: ERD

SECTION 3.3: ENTITY RELATIONSHIP DIAGRAM TO RELATIONAL SCHEMA



Functional Dependency

EmployeeID	→ fname, lname, phone, email, address
VCID	→ dateofJoining, dateofLeaving
InstructorID	→ departmentID
deanID	→ dateofJoining, dateofLeaving
DepartmentheadID	→ dateofJoining, dateofLeaving
SchoolID	→ schoolname, deanID
DepartmentID	→ departmentname, departmentheadID, schoolID
DegreeprogramID	→ degreeprogramname, departmentID
CourseID	→ coursename, coursetype, creditNumber
DegreeprogramID, CourseID	→ enrollmentTerm
CourseID, SemesterID	→ offeredcourses
StudentID	→ fname, lname, dateofbirth, gender, phone, email, address, departmentID
StudentID, degreeprogramID	→ enrollmentdate
StudentID, SectionNo, SemesterID, CourseID	→ registrationdate
SemesterID	→ season, year
SectionNo, semesterID, courseID	→ capacity, instructorID
AssessmentID	→ totalmarksachievable, markspercentage, assessmentType, assessmentNo, questionNo, courseID, colID, semesterID, SectionNo
StudentID, AssessmentID	→ totalmarksobtained, instructorID
ColID, CourseID	→ description, passThreshold, ploID
ploID	→ description, degreeprogramID



1NF

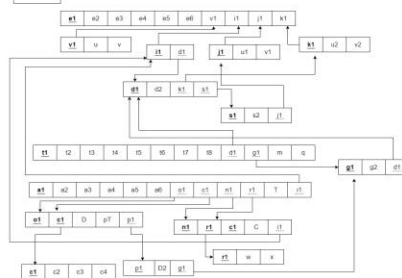
$\{ \text{e1} \} \rightarrow \{ \text{e2}, \text{e3}, \text{e4}, \text{e5}, \text{e6}, \text{v1}, \text{v}, \text{t1}, \text{t2}, \text{t3}, \text{t4}, \text{t5}, \text{t6}, \text{t7}, \text{t8}, \text{t9}, \text{t10}, \text{t11}, \text{t12}, \text{t13}, \text{t14}, \text{t15}, \text{t16}, \text{t17}, \text{t18}, \text{t19}, \text{t20}, \text{t21}, \text{t22}, \text{t23}, \text{t24}, \text{t25}, \text{t26}, \text{t27}, \text{t28}, \text{t29}, \text{t30}, \text{t31}, \text{t32}, \text{t33}, \text{t34}, \text{t35}, \text{t36}, \text{t37}, \text{t38}, \text{t39}, \text{t40}, \text{t41}, \text{t42}, \text{t43}, \text{t44}, \text{t45}, \text{t46}, \text{t47}, \text{t48}, \text{t49}, \text{t50}, \text{t51}, \text{t52}, \text{t53}, \text{t54}, \text{t55}, \text{t56}, \text{t57}, \text{t58}, \text{t59}, \text{t60}, \text{t61}, \text{t62}, \text{t63}, \text{t64}, \text{t65}, \text{t66}, \text{t67}, \text{t68}, \text{t69}, \text{t70}, \text{t71}, \text{t72}, \text{t73}, \text{t74}, \text{t75}, \text{t76}, \text{t77}, \text{t78}, \text{t79}, \text{t80}, \text{t81}, \text{t82}, \text{t83}, \text{t84}, \text{t85}, \text{t86}, \text{t87}, \text{t88}, \text{t89}, \text{t90}, \text{t91}, \text{t92}, \text{t93}, \text{t94}, \text{t95}, \text{t96}, \text{t97}, \text{t98}, \text{t99}, \text{t100} \}$

2NF

Here, v1, t1, j1, k1 all are e1 (VCID, InstructorID, DeanID, DepartmentID all are Employee ID)



3NF



BCNF

No non-key can identify any primary key or part of the primary key. Therefore, all the relations are in BCNF.

Figure: Normalization diagram

SECTION: 3.5: DATA DICTIONARY

employee_T

Name	Data Type	Size	Remark
employee_id	CHAR	4	This is the primary key of the employee. Example: “4521”
fName	VARCHAR	30	This is the first name of the employee. Example: “Anwar”
lName	VARCHAR	30	This is the last name of the employee. Example: “Kabir”
phone	VARCHAR	15	This is the contact number of the employee. Example: “+8801943876498”
Email	VARCHAR	50	This is the email id of the employee. Example: “ anwarkabir@gmail.com ”
address	VARCHAR	100	This is the address of the employee. Example: “ House 1, Road 1, Sector 1, Uttara, Dhaka, Bangladesh”

vc_t

Name	Data Type	Size	Remark
employee_id	CHAR	4	This is the primary key of the VC. This is also the foreign key from the employee table. Example: “4321”
dateOfJoining	DATE	YYYY-MM-DD	This is the joining date of the VC. Example: “2018-05-15”
dateOfLeaving	DATE	YYYY-MM-DD	This is the leaving date of the VC. Example: “2021-04-29”

dean_t

Name	Data Type	Size	Remark
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employee_id	CHAR	4	This is the primary key of the dean. This is also the foreign key from the employee table. Example: "4621"
dateOfJoining	DATE	YYYY-MM-DD	This is the joining date of the dean. Example: "2018-05-15"
dateOfLeaving	DATE	YYYY-MM-DD	This is the leaving date of the dean. Example: "2021-04-29"

departmentHead_t

Name	Data Type	Size	Remark
employee_id	CHAR	4	This is the primary key of the department head. This is also the foreign key from the employee table. Example: "4121"
dateOfJoining	DATE	YYYY-MM-DD	This is the joining date of the department head. Example: "2018-05-15"
dateOfLeaving	DATE	YYYY-MM-DD	This is the leaving date of the department head. Example: "2021-04-29"

school_t

Name	Data Type	Size	Remark
school_id	CHAR	4	This is primary key of a school. Example: "SETS"
school_name	VARCHAR	50	This is the name of the school. Example: "School of Engineering, Technology & Science"
dean_id	CHAR	4	This is the foreign key from dean table. Example: 4621

department_t

Name	Data Type	Size	Remark
department_id	CHAR	3	This is the primary key of a department. Example: "CSE"
department_name	VARCHAR	50	This is the name of a department. Example: "Computer Science & Engineering"
departmentHead_id	CHAR	4	"This is the foreign key from department head table. Example: "4121"
school_id	CHAR	4	This is the foreign key from the school table. Example: SETS

instructor_t

Name	Data Type	Size	Remark
instructor_id	CHAR	4	This is the primary key of an instructor. This is also the foreign key from employee table. Example: 4253
department_id	CHAR	3	This is the foreign key of a department. Example: "CSE"

degreeProgram_t

Name	Data Type	Size	Remark
degreeProgram_id	CHAR	5	This is the primary key for a degree program. Example: "B.Sc"
degreeProgramName	VARCHAR	50	This is the name of the degree program. Example: "Bachelor of Science"
department_id	CHAR	3	This is the foreign key from the department table. Example: "CSE"

Course_t

Name	Data Type	Size	Remark
course_id	VARCHAR	7	This is the primary key for a course id. Example: CSE303L
courseName	VARCHAR	50	This is the name of the course. Example: Data Structure
courseType	VARCHAR	10	This is the type of course. Example: Core
credit	NUMBER	3,2	This is number of credit the course have. Example: 3.00

student_t

Name	Data Type	Size	Remark
student_id	CHAR	7	This is the primary key of the student. Example: "1530123"
fName	VARCHAR	30	This is the first name of the student. Example: "Kaysar"
lName	VARCHAR	30	This is the last name of the student. Example: "Alam"
dateOfBirth	DATE	YYYY-MM-DD	This is the date of birth of the student. Example: 1995-07-26

gender	VARCHAR	6	This is the gender of the student. Example: "Male"
phone	VARCHAR	15	This is the contact number of the employee. Example: "+8801787395375"
Email	VARCHAR	50	This is the email id of the employee. Example: " kaysaralam@gmail.com "
address	VARCHAR	100	This is the address of the employee. Example: "House 10, Road 7, Sector 3, Uttara, Dhaka, Bangladesh"
department_id	CHAR	3	This is the foreign key from the department table. Example: "CSE"

enrollment_t

Name	Data Type	Size	Remark
student_id	CHAR	7	This is the primary key of enrollment. This is also the foreign key from student table. Example: 1510123
degreeProgram_id	CHAR	5	This is the primary key of enrollment. This is also the foreign key from degree program table. Example: B.Sc
enrollmentDate	DATE	YYYY-MM-DD	This is date of the student's enrollment. Example: 2021-01-10

semester_t

Name	Data type	Size	Remark
semester_id	INTEGER		This is the primary key of semester. Example: 3
season	VARCHAR	6	This is the name of the semester. Example: Fall
year	CHAR	4	This is the year. Example: 2021

section_t

Name	Data Type	Size	Remark
section_no	INTEGER		This is the primary key of a section. Example: 1
semester_id	INTEGER		This is the foreign key from semester table. Example: 3
course_id	VARCHAR	7	This is the foreign key from the course table. Example: CSE303L

capacity	INTEGER		This is total capacity of students of a section. Example: 50
instructor_id	CHAR	4	This is the foreign key from instructor table. Example: 4321

registration_t

Name	Data type	Size	Remark
student_id	CHAR	7	This is the primary key of registration. This is also the foreign key from student table. Example: "1510123"
section_no	INTEGER		This is the primary key of registration. This is also the foreign key from section table. Example: 1
semester_id	INTEGER		This is the primary key of registration. This is also the foreign key from semester table. Example: 3
course_id	VARCHAR	7	This is the primary key of registration. This is also the foreign key from course table. Example: "CSE303L"
registrationDate	YEAR	YYYY-MM-DD	This is the date of the registration. Example: "2021-01-10"

courseOffered_t

Name	Data type	Size	Remark
course_id	VARCHAR	7	This is the primary key of course offered. This is also the foreign key from course table. Example: "CSE303L"
degreeProgram_id	CHAR	5	This is the primary key of course offered. This is also the foreign key from degree program table. Example: B.Sc
courseTitle	VARCHAR	50	This is the title of the course. Example: Introduction to Business

offeredInSemester_t

Name	Data type	Size	Remark
course_id	VARCHAR	7	This is the primary key of offered in semester. This is also the foreign key from course table. Example: BBA101

semester_id	INTEGER		This is the primary key of offered in semester. This is also the foreign key from semester table. Example: 3
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plo_t

Name	Data Type	Size	Remark
plo_id	VARCHAR	10	This is the primary key of plo_id. Example: PLO 01
description	VARCHAR	100	This is the description of the PLO.
degreeProgram_id	CHAR	5	This is the foreign key from degree program table.

co_t

Name	Data Type	Size	Remark
co_id	VARCHAR	10	This is the primary key of co. Example: Co 02
course_id	VARCHAR	7	This is the foreign key from course table. Example: ENG100
description	VARCHAR	50	This is the description of the CO
plo_id	VARCHAR	10	This is the foreign key from PLO table. Example: PLO 01

assessment_t

Name	Data Type	Size	Remark
assessment_id	INTEGER		This is the primary key of assessment. Example: 01
achievableMark	NUMERIC		This is mark achievable from a test or certain question. Example: 10
marksPercentage	NUMERIC		This is total percentage of marks. Example: 20
assessmentType	VARCHAR	30	This is to define assessment type. Example: "Midterm"
assessmentNo	INTEGER		This is number of assessment. Example: 2
questionNo	INTEGER		This is the question number. Example: 3
course_id	VARCHAR	7	This is the foreign key from the course table. Example: CSE201
co_id	VARCHAR	10	This is the foreign key from the co table. Example: CO 02
semester_id	INTEGER		This is the foreign key from the semester table. Example: 3
section_no	INTEGER		This is the foreign key from the section table. Example: 1

evaluation_t

Name	Data Type	Size	Remark
student_id	CHAR	7	This is the primary key of evaluation. This is also the foreign key from student table. Example: 1815332
assessment_id	INTEGER		This is the primary key of evaluation. This is also the foreign key from assessment table. Example: 01
obtainedMarks	NUMERIC		This is the number of marks obtained.
instructor_id	CHAR	4	This is the foreign key from instructor table. Example: 4123

CHAPTER 4: PHYSICAL SYSTEM DESIGN