

After our second feedback, we were missing a few necessary constraints in some of our attributes. Firstly, all the attributes related to names lacked an alphabet-only constraint. We resolved this issue by enforcing constraints on every attribute related to names, such that only lowercase and uppercase letters were allowed, while all invalid characters were prevented. The constraints were applied on the lab\_name attribute of the bookings table, Name attribute of the project table, and all name attributes (First\_Name, Second\_Name and Last\_Name) of the professor, staff and student tables.

```
➤ CREATE TABLE IF NOT EXISTS bookings (  
    id INT AUTO_INCREMENT PRIMARY KEY,  
    user_email VARCHAR(255) NOT NULL,  
    name VARCHAR(255) NOT NULL,  
    lab_name VARCHAR(255) NOT NULL,  
    time_slot VARCHAR(255) NOT NULL,  
    date DATE NOT NULL,  
    CONSTRAINT chk_name_letters_only CHECK (name REGEXP '^[A-Za-z]+$')  
);  
  
➤ CREATE TABLE `professor` (  
    `Employee_ID` bigint NOT NULL,  
    `First_Name` varchar(255) NOT NULL,  
    `Middle_Name` varchar(255) DEFAULT NULL,  
    `Last_Name` varchar(255) DEFAULT NULL,  
    `Grant_Aid` float DEFAULT '0',  
    `Office_Number` varchar(255) DEFAULT NULL,  
    `Email_ID` VARCHAR(255) CHECK (Email_ID REGEXP '^[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Za-z]{2,}$'),  
    `Contact` bigint DEFAULT NULL,  
    `password` varchar(255) DEFAULT NULL,  
    PRIMARY KEY (`Employee_ID`),  
    UNIQUE KEY `Employee_ID` (`Employee_ID`),  
    CONSTRAINT Grnt_aid CHECK (`Grant_Aid` >= 0),  
    CONSTRAINT `professor_chk_2` CHECK (((`Contact` >= 1000000000) and (`Contact` < 1000000000))),  
    CONSTRAINT chk_name_letters_only1 CHECK (First_Name REGEXP '^[A-Za-z]+$'),  
    CONSTRAINT chk_Middle_Name_letters_only CHECK (Middle_Name REGEXP '^[A-Za-z]+$'),  
    CONSTRAINT chk_Last_Name_letters_only CHECK (Last_Name REGEXP '^[A-Za-z]+$')  
)  
ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;  
/*!40101 SET character_set_client = @saved_cs_client */;
```

```

> CREATE TABLE `project` (
    `Project_ID` varchar(255) NOT NULL,
    `Name` varchar(255) NOT NULL,
    `Grant_Aid` float DEFAULT '0',
    PRIMARY KEY (`Project_ID`),
    UNIQUE KEY `Project_ID` (`Project_ID`),
    CONSTRAINT Proj_Aid CHECK (`Grant_Aid` >= 0),
    CONSTRAINT check_name_letters_only CHECK (Name REGEXP '^[a-zA-Z ]+$')
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

> CREATE TABLE `staff` (
    `Employee_ID` bigint NOT NULL,
    `First_Name` varchar(255) NOT NULL,
    `Middle_Name` varchar(255) DEFAULT NULL,
    `Last_Name` varchar(255) DEFAULT NULL,
    `Salary` float DEFAULT NULL,
    `Role` enum('Assistant','Researcher','Technician') DEFAULT NULL,
    `Lab_Name` ENUM('Anatomy Lab', 'Biochemistry Lab', 'Biology Lab', 'Botany Lab', 'Chemistry
    `Email_ID` VARCHAR(255) CHECK (Email_ID REGEXP '^[A-Za-z0-9._%+-]@[A-Za-z0-9.-]+\.[A-Za-z]{
    `Contact` bigint DEFAULT NULL,
    `img_url` VARCHAR(255) DEFAULT NULL,
    `img_caption` VARCHAR(255) DEFAULT NULL,
    `password` varchar(255) DEFAULT NULL,
    PRIMARY KEY (`Employee_ID`),
    UNIQUE KEY `Employee_ID` (`Employee_ID`),
    CONSTRAINT Staf_Sal CHECK (`Salary` >= 0),
    CONSTRAINT `staff_chk_2` CHECK (((`Contact` >= 1000000000) and (`Contact` < 10000000000))),
    CONSTRAINT `staff_fk_2` FOREIGN KEY (`Lab_Name`) REFERENCES `lab` (`Lab_Name`),
    CONSTRAINT staff_First_Name CHECK (First_Name REGEXP '^[a-zA-Z ]+$'),
    CONSTRAINT staff_Middle_Name CHECK (Middle_Name REGEXP '^[a-zA-Z ]+$'),
    CONSTRAINT staff_Last_Name CHECK (Last_Name REGEXP '^[a-zA-Z ]+$')

```

```

CREATE TABLE `students` (
  `Roll_Number` int NOT NULL,
  `First_Name` varchar(255) NOT NULL,
  `Middle_Name` varchar(255) DEFAULT NULL,
  `Last_Name` varchar(255) DEFAULT NULL,
  `Batch` int DEFAULT NULL,
  `Degree` ENUM('MTech','BTech','PhD') NOT NULL,
  `Amount_Due` float DEFAULT '0',
  `Purpose` varchar(255) DEFAULT NULL,
  `Dept_Name` ENUM('CE', 'CL', 'CSE', 'EE', 'ME', 'MSE') NOT NULL,
  `Email_ID` VARCHAR(255) CHECK (Email_ID REGEXP '^([A-Za-z0-9._%+-])+@[A-Za-z0-9.-]+\.[A-Za-z]{2,}$'),
  `Contact` bigint DEFAULT NULL,
  `password` VARCHAR(255) DEFAULT NULL,
  PRIMARY KEY (`Roll_Number`),
  UNIQUE KEY `Roll_Number` (`Roll_Number`),
  CONSTRAINT Stud_Amount_due_2 CHECK (`Amount_Due` >= 0),
  CONSTRAINT Con_Batch CHECK (`Batch` >= 0),
  CONSTRAINT `students_chk_2` CHECK (((`Contact` >= 1000000000) and (`Contact` < 1000000000))),
  CONSTRAINT `students_fk_2` FOREIGN KEY (`Dept_Name`) REFERENCES `department` (`Dept_Name`),
  CONSTRAINT stud_First_name CHECK (First_Name REGEXP '^([a-zA-Z ]+$)'),
  CONSTRAINT stud_Middle_name CHECK (Middle_Name REGEXP '^([a-zA-Z ]+$)'),
  CONSTRAINT stud_last_name CHECK (Last_Name REGEXP '^([a-zA-Z ]+$)')
)

```

Another fault in our system was that the amt\_alloc, Grant\_amt, Grnt\_aid, inv\_quant, lab\_Gnt\_Aid, Proj\_Aid, salary and batch & Amount\_due attributes of the lab, grants, professor, inventory, lab\_grant, project, staff and student table respectively were allowing negative inputs. We fixed that by implementing a constraint that would ensure only positive values were entered.

```

CREATE TABLE `lab` (
  `Lab_Name` ENUM('Anatomy Lab', 'Biochemistry Lab', 'Biology Lab', 'Botany Lab', 'Chemistry Lab', '
  `Room_No` int DEFAULT NULL,
  `Block_No` int DEFAULT NULL,
  `Amount_Allocated` float DEFAULT '0',
  `Working_Hours` int DEFAULT NULL,
  `Capacity` int DEFAULT NULL,
  `Email_ID` VARCHAR(255) CHECK (Email_ID REGEXP '^([A-Za-z0-9._%+-])+@[A-Za-z0-9.-]+\.[A-Za-z]{2,}$'),
  `Contact` bigint DEFAULT NULL,
  PRIMARY KEY (`Lab_Name`),
  UNIQUE KEY `Lab_Name` (`Lab_Name`),
  CONSTRAINT `lab_chk_2` CHECK (((`Contact` >= 1000000000) and (`Contact` < 1000000000))),
  CONSTRAINT amt_alloc CHECK (`Amount_Allocated` >= 0)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

```

```

> CREATE TABLE `grants` (
  `ID` int NOT NULL,
  `Lab_Name` ENUM('Anatomy Lab', 'Biochemistry Lab', 'Biology Lab',
  `Donor` varchar(255) NOT NULL,
  `Donating_Organization` varchar(255) NOT NULL,
  `Amount` float NOT NULL,
  `Receiving_Date` date NOT NULL,
  PRIMARY KEY (`ID`),
  UNIQUE KEY `ID` (`ID`),
  KEY `idx_donating_organization` (`Donating_Organization`),
  KEY `idx_amount` (`Amount`),
  KEY `idx_receiving_date` (`Receiving_Date`),
  CONSTRAINT Grant_amt CHECK (`Amount` >= 0)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

> CREATE TABLE `professor` (
  `Employee_ID` bigint NOT NULL,
  `First_Name` varchar(255) NOT NULL,
  `Middle_Name` varchar(255) DEFAULT NULL,
  `Last_Name` varchar(255) DEFAULT NULL,
  `Grant_Aid` float DEFAULT '0',
  `Office_Number` varchar(255) DEFAULT NULL,
  `Email_ID` VARCHAR(255) CHECK (Email_ID REGEXP '^[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Za-z]{2,}$'),
  `Contact` bigint DEFAULT NULL,
  `password` varchar(255) DEFAULT NULL,
  PRIMARY KEY (`Employee_ID`),
  UNIQUE KEY `Employee_ID` (`Employee_ID`),
  CONSTRAINT Grnt_aid CHECK (`Grant_Aid` >= 0),
  CONSTRAINT `professor_chk_2` CHECK (((`Contact` >= 1000000000) and (`Contact` < 1000000000))),
  CONSTRAINT chk_name_letters_only1 CHECK (First_Name REGEXP '^[A-Za-z]+$'),
  CONSTRAINT chk_Middle_Name_letters_only CHECK (Middle_Name REGEXP '^[A-Za-z]+$'),
  CONSTRAINT chk_Last_Name_letters_only CHECK (Last_Name REGEXP '^[A-Za-z]+$')
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

```

```

CREATE TABLE `inventory` (
  `ID` bigint NOT NULL,
  `Equipment_Name` varchar(255) NOT NULL,
  `Price` float DEFAULT NULL,
  `Vendor_Address` varchar(255) DEFAULT NULL,
  `Vendor_Phone_Number` varchar(255) DEFAULT NULL,
  `Manufacturer_Name` varchar(255) DEFAULT NULL,
  `isAvailable` BOOLEAN DEFAULT 1,
  `Lab_Name` ENUM('Anatomy Lab', 'Biochemistry Lab', 'Biology Lab', '
  `Quantity` int DEFAULT NULL,
  PRIMARY KEY (`ID`),
  UNIQUE KEY `ID` (`ID`),
  CONSTRAINT inv_quant CHECK (`Quantity` >= 0)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

```

```

CREATE TABLE `lab_grant` (
  `Lab_Name` ENUM('Anatomy Lab', 'Biochemistry Lab', 'Biology Lab', 'Botany Lab', 'Ch
  `ID` int NOT NULL,
  `Donating_Organization` varchar(255) DEFAULT NULL,
  `Amount` float NOT NULL,
  `Receiving_Date` date DEFAULT NULL,
  PRIMARY KEY (`Lab_Name`, `ID`),
  KEY `lab_grant_fk_1` (`ID`),
  CONSTRAINT lab_Gnt_Aid CHECK (`Amount` >= 0),
  CONSTRAINT `lab_grant_fk_1` FOREIGN KEY (`ID`) REFERENCES `grants` (`ID`),
  CONSTRAINT `lab_grant_fk_2` FOREIGN KEY (`Lab_Name`) REFERENCES `lab` (`Lab_Name`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
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```

```

> CREATE TABLE `project` (
    `Project_ID` varchar(255) NOT NULL,
    `Name` varchar(255) NOT NULL,
    `Grant_Aid` float DEFAULT '0',
    PRIMARY KEY (`Project_ID`),
    UNIQUE KEY `Project_ID` (`Project_ID`),
    CONSTRAINT Proj_Aid CHECK (`Grant_Aid` >= 0),
    CONSTRAINT check_name_letters_only CHECK (Name REGEXP '^[a-zA-Z ]+$')
~ ) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
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> CREATE TABLE `staff` (
    `Employee_ID` bigint NOT NULL,
    `First_Name` varchar(255) NOT NULL,
    `Middle_Name` varchar(255) DEFAULT NULL,
    `Last_Name` varchar(255) DEFAULT NULL,
    `Salary` float DEFAULT NULL,
    `Role` enum('Assistant','Researcher','Technician') DEFAULT NULL,
    `Lab_Name` ENUM('Anatomy Lab', 'Biochemistry Lab', 'Biology Lab', 'Botany Lab', 'Chemistry Lab', 'Genetics Lab', 'Immunology Lab', 'Microbiology Lab', 'Molecular Biology Lab', 'Neurobiology Lab', 'Plant Biology Lab', 'Physiology Lab', 'Zoology Lab'),
    `Email_ID` VARCHAR(255) CHECK (Email_ID REGEXP '^[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Za-z]{2,}$'),
    `Contact` bigint DEFAULT NULL,
    `img_url` VARCHAR(255) DEFAULT NULL,
    `img_caption` VARCHAR(255) DEFAULT NULL,
    `password` varchar(255) DEFAULT NULL,
    PRIMARY KEY (`Employee_ID`),
    UNIQUE KEY `Employee_ID` (`Employee_ID`),
    CONSTRAINT Staf_Sal CHECK (`Salary` >= 0),
    CONSTRAINT `staff_chk_2` CHECK (((`Contact` >= 1000000000) and (`Contact` < 10000000000))),
    CONSTRAINT `staff_fk_2` FOREIGN KEY (`Lab_Name`) REFERENCES `lab` (`Lab_Name`),
    CONSTRAINT staff_First_Name CHECK (First_Name REGEXP '^[a-zA-Z ]+$'),
    CONSTRAINT staff_Middle_Name CHECK (Middle_Name REGEXP '^[a-zA-Z ]+$'),
    CONSTRAINT staff_Last_Name CHECK (Last_Name REGEXP '^[a-zA-Z ]+$')

```



```

CREATE TABLE `students` (
  `Roll_Number` int NOT NULL,
  `First_Name` varchar(255) NOT NULL,
  `Middle_Name` varchar(255) DEFAULT NULL,
  `Last_Name` varchar(255) DEFAULT NULL,
  `Batch` int DEFAULT NULL,
  `Degree` ENUM('MTech','BTech','PhD') NOT NULL,
  `Amount_Due` float DEFAULT '0',
  `Purpose` varchar(255) DEFAULT NULL,
  `Dept_Name` ENUM('CE', 'CL', 'CSE', 'EE', 'ME', 'MSE') NOT NULL,
  `Email_ID` VARCHAR(255) CHECK (Email_ID REGEXP '^[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Za-z]{2,}$'),
  `Contact` bigint DEFAULT NULL,
  `password` VARCHAR(255) DEFAULT NULL,
  PRIMARY KEY (`Roll_Number`),
  UNIQUE KEY `Roll_Number` (`Roll_Number`),
  CONSTRAINT Stud_Amount_due_2 CHECK (`Amount_Due` >= 0),
  CONSTRAINT Con_Batch CHECK (`Batch` >= 0),
  CONSTRAINT `students_chk_2` CHECK (((`Contact` >= 1000000000) and (`Contact` < 1000000000))),
  CONSTRAINT `students_fk_2` FOREIGN KEY (`Dept_Name`) REFERENCES `department` (`Dept_Name`),
  CONSTRAINT stud_First_name CHECK (First_Name REGEXP '^[a-zA-Z ]+$'),
  CONSTRAINT stud_Middle_name CHECK (Middle_Name REGEXP '^[a-zA-Z ]+$'),
  CONSTRAINT stud_last_name CHECK (Last_Name REGEXP '^[a-zA-Z ]+$')

```

With these constraints, we successfully made sure our database had a valid data entry system with no invalid inputs.