# TITLE OF THE PROJECT

## Submitted by

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**Class Roll Number:** 28
**Stream:** C.S.B.S
**Subject:** Programming for Problem Solving
**Subject Code:** IVC101
**Department:** Basic Science and Humanities

Under the supervision of
Name of the teachers

**Academic Year: 2022-26**

PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE FIRST SEMESTER

**DEPARTMENT OF BASIC SCIENCE AND HUMANITIES**
**INSTITUTE OF ENGINEERING AND MANAGEMENT, KOLKATA**

# CERTIFICATE OF RECOMMENDATION

We hereby recommed that the project prepared under our supervision by Aritra Ghosal, entitled Title of the Project be accepted in partial fulfillment of the requirements for the degree of partial fulfillment of the first semester.

| | |
|---|---|
| Head of the Department<br>Basic Sciences and Humanities<br>IEM, Kolkata | Project Supervisor |

# 1 Introduction

Python is a versatile and easy to use language often used in data manipulation. What separates Python from all other languages is its large number of use cases. Whereas Javascript is used for the web, C for systems, R for data, Python can be used for all three and many more. The following project demonstrates a model system run using mainly python.

## 1.1 Objective

This project attempts to model a small scale database management system utilized by an academic institution. The objective of this project is to learn and demonstrate several python programming concepts including:

- Using python code from other files
- Importing and using third party modules
- Reading and writing text files
- Managing CSV data
- Plotting data
- Building a basic user interface
- Utilizing concepts of Object Oriented Programming

This project also demonstrates general programming concepts such as ER diagrams.

## 1.2 Organization of the Project

```
.
├── code
│   ├── batch.py
│   ├── course.py
│   ├── department.py
│   ├── examination.py
│   ├── main.py
│   └── student.py
├── databases
│   ├── batch.csv
│   ├── course.csv
│   ├── department.csv
│   └── student.csv
├── fonts
│   ├── CONSOLAB.TTF
│   ├── timesnewroman-bold.ttf
│   ├── timesnewroman-bolditalic.ttf
│   ├── timesnewroman-italic.ttf
│   └── timesnewroman-regular.ttf
├── images
│   ├── … .2 instructions
│   ├── IEM logo.png
│   ├── Project Details.docx
│   └── Project Report Template.docx
├── latex
│   ├── er-diagram.sty
│   ├── er.tex
│   ├── project.tex
│   └── template.tex
├── Makefile
└── outputs
    ├── screenshots
    └── …
```

The **code** directory contains all the python code that is being executed at runtime. **batch.py** is a module that exports functions that operate on a batch. Likewise, **course.py** is a module that exports functions that operate on courses in the database. Same for **department.py**, which is a module that exports functions that operate on a department. **examination.py** exports the **Examination** class that represents an examination being held by the institution. **main.py** is a file with executive permissions which imports all of the above and runs a simple graphical user interface to demonstrate the modules.

The **databases** directory contains all the data in CSV format.

The **fonts** directory contains the fonts required to compile this document.

The **images** directory contains all of the images required tomake the interface.

The **instructions** directory contains all of the raw material to given to build this project.

The **latex** directory contains all of the LaTeX code used to build the project report (this file). **template.tex** sets the default values necessary for the project report. **project.tex** contains the code that is compiled into the project report. It contains sources the outputs and diagrams along with the python code to include in the project report.
**er.tex** contains the er diagram for the database and **er-diagram.sty** is a third party library used to draw the er diagram. **output.tex** is an automatically generated file which sources all of the plots into the final report.

The **Makefile** contains the build system for the entire project. It specifies the dependencies for each component and runs the commands to create each component. The **Makefile** also contains code that generates the databases and fills them with random data modelling the system as closely as possible. This is the centre point of the entire project, it determines the order and execution of everything else in the project.

The **outputs** directory contains all of the output generated by the python code at runtime. The **screenshots** folder contains the screenshots of the Graphic User Interface.

# 2 Database Descriptions

Each student in the **student.csv** database has a unique ID, along with a name and a class roll number. Each student is associated with a single batch.
Each batch in **batch.csv** is assigned a unique ID. They also have name and a department they fall under. Each batch has a list of courses and a list of students who appear for the courses.
Each course in **course.csv** has an ID, subject name and a storage of marks obtained by each student appearing for the course.
Each department in **department.csv** has an ID, name and list of batches that worked under that department.

## 2.1 Database Samples

**batch.csv**

| Batch ID | Batch Name | Department Name | List of Courses | List of Students |
|---|---|---|---|---|
| CSE00 | CSE 2000-2004 | CSE | … | … |
| CSE02 | CSE 2002-2006 | CSE | … | … |
| CSE03 | CSE 2003-2007 | CSE | … | … |
| CSE04 | CSE 2004-2008 | CSE | … | … |
| CSE11 | CSE 2011-2015 | CSE | … | … |

| | | | | |
|---|---|---|---|---|
| CSE20 | CSE 2020-2024 | CSE | … | … |
| CSE21 | CSE 2021-2025 | CSE | … | … |
| CSE92 | CSE 1992-1996 | CSE | … | … |
| CSE95 | CSE 1995-1999 | CSE | … | … |
| CSE98 | CSE 1998-2002 | CSE | … | … |
| CSE99 | CSE 1999-2003 | CSE | … | … |
| ECE01 | ECE 2001-2005 | ECE | … | … |
| ECE03 | ECE 2003-2007 | ECE | … | … |
| ECE05 | ECE 2005-2009 | ECE | … | … |
| ECE06 | ECE 2006-2010 | ECE | … | … |
| ECE11 | ECE 2011-2015 | ECE | … | … |
| ECE12 | ECE 2012-2016 | ECE | … | … |
| ECE13 | ECE 2013-2017 | ECE | … | … |
| ECE14 | ECE 2014-2018 | ECE | … | … |
| ECE17 | ECE 2017-2021 | ECE | … | … |
| ECE18 | ECE 2018-2022 | ECE | … | … |
| ECE20 | ECE 2020-2024 | ECE | … | … |
| ECE94 | ECE 1994-1998 | ECE | … | … |
| ECE96 | ECE 1996-2000 | ECE | … | … |
| ECE97 | ECE 1997-2001 | ECE | … | … |
| ECE98 | ECE 1998-2002 | ECE | … | … |
| ECE99 | ECE 1999-2003 | ECE | … | … |
| IT06 | IT 2006-2010 | IT | … | … |
| IT07 | IT 2007-2011 | IT | … | … |
| IT08 | IT 2008-2012 | IT | … | … |
| IT09 | IT 2009-2013 | IT | … | … |
| IT13 | IT 2013-2017 | IT | … | … |
| IT14 | IT 2014-2018 | IT | … | … |
| IT15 | IT 2015-2019 | IT | … | … |
| IT16 | IT 2016-2020 | IT | … | … |
| IT18 | IT 2018-2022 | IT | … | … |
| IT19 | IT 2019-2023 | IT | … | … |
| IT22 | IT 2022-2026 | IT | … | … |
| IT89 | IT 1989-1993 | IT | … | … |
| IT91 | IT 1991-1995 | IT | … | … |
| IT92 | IT 1992-1996 | IT | … | … |
| ME03 | ME 2003-2007 | ME | … | … |

| | | | | |
|---|---|---|---|---|
| ME04 | ME 2004-2008 | ME | … | … |
| ME05 | ME 2005-2009 | ME | … | … |
| ME08 | ME 2008-2012 | ME | … | … |
| ME09 | ME 2009-2013 | ME | … | … |
| ME12 | ME 2012-2016 | ME | … | … |
| ME15 | ME 2015-2019 | ME | … | … |
| ME19 | ME 2019-2023 | ME | … | … |
| ME21 | ME 2021-2025 | ME | … | … |
| ME22 | ME 2022-2026 | ME | … | … |
| ME90 | ME 1990-1994 | ME | … | … |
| ME91 | ME 1991-1995 | ME | … | … |
| ME92 | ME 1992-1996 | ME | … | … |
| ME93 | ME 1993-1997 | ME | … | … |
| ME94 | ME 1994-1998 | ME | … | … |
| ME98 | ME 1998-2002 | ME | … | … |
| CSE15 | CSE 2015-2019 | CSE | … | … |

**`course.csv`**

| Course ID | Course Name | Marks Obtained |
|---|---|---|
| CSE00 | CSE 2000-2004 | CSE |
| CSE02 | CSE 2002-2006 | CSE |
| CSE03 | CSE 2003-2007 | CSE |
| CSE04 | CSE 2004-2008 | CSE |
| CSE11 | CSE 2011-2015 | CSE |
| CSE20 | CSE 2020-2024 | CSE |
| CSE21 | CSE 2021-2025 | CSE |
| CSE92 | CSE 1992-1996 | CSE |
| CSE95 | CSE 1995-1999 | CSE |
| CSE98 | CSE 1998-2002 | CSE |
| CSE99 | CSE 1999-2003 | CSE |
| ECE01 | ECE 2001-2005 | ECE |
| ECE03 | ECE 2003-2007 | ECE |
| ECE05 | ECE 2005-2009 | ECE |
| ECE06 | ECE 2006-2010 | ECE |
| ECE11 | ECE 2011-2015 | ECE |
| ECE12 | ECE 2012-2016 | ECE |

| | | |
|---|---|---|
| ECE13 | ECE 2013-2017 | ECE |
| ECE14 | ECE 2014-2018 | ECE |
| ECE17 | ECE 2017-2021 | ECE |
| ECE18 | ECE 2018-2022 | ECE |
| ECE20 | ECE 2020-2024 | ECE |
| ECE94 | ECE 1994-1998 | ECE |
| ECE96 | ECE 1996-2000 | ECE |
| ECE97 | ECE 1997-2001 | ECE |
| ECE98 | ECE 1998-2002 | ECE |
| ECE99 | ECE 1999-2003 | ECE |
| IT06 | IT 2006-2010 | IT |
| IT07 | IT 2007-2011 | IT |
| IT08 | IT 2008-2012 | IT |
| IT09 | IT 2009-2013 | IT |
| IT13 | IT 2013-2017 | IT |
| IT14 | IT 2014-2018 | IT |
| IT15 | IT 2015-2019 | IT |
| IT16 | IT 2016-2020 | IT |
| IT18 | IT 2018-2022 | IT |
| IT19 | IT 2019-2023 | IT |
| IT22 | IT 2022-2026 | IT |
| IT89 | IT 1989-1993 | IT |
| IT91 | IT 1991-1995 | IT |
| IT92 | IT 1992-1996 | IT |
| ME03 | ME 2003-2007 | ME |
| ME04 | ME 2004-2008 | ME |
| ME05 | ME 2005-2009 | ME |
| ME08 | ME 2008-2012 | ME |
| ME09 | ME 2009-2013 | ME |
| ME12 | ME 2012-2016 | ME |
| ME15 | ME 2015-2019 | ME |
| ME19 | ME 2019-2023 | ME |
| ME21 | ME 2021-2025 | ME |
| ME22 | ME 2022-2026 | ME |
| ME90 | ME 1990-1994 | ME |
| ME91 | ME 1991-1995 | ME |
| ME92 | ME 1992-1996 | ME |

| | | |
|---|---|---|
| ME93 | ME 1993-1997 | ME |
| ME94 | ME 1994-1998 | ME |
| ME98 | ME 1998-2002 | ME |
| CSE15 | CSE 2015-2019 | CSE |

**`department.csv`**

| Department ID | Department Name | List of Batches |
|---|---|---|
| CSE | Computer Science and Engineering | … |
| ECE | Electronics and Communication Engineering | … |
| IT | Information Technology | … |
| BA | Business Administration | … |

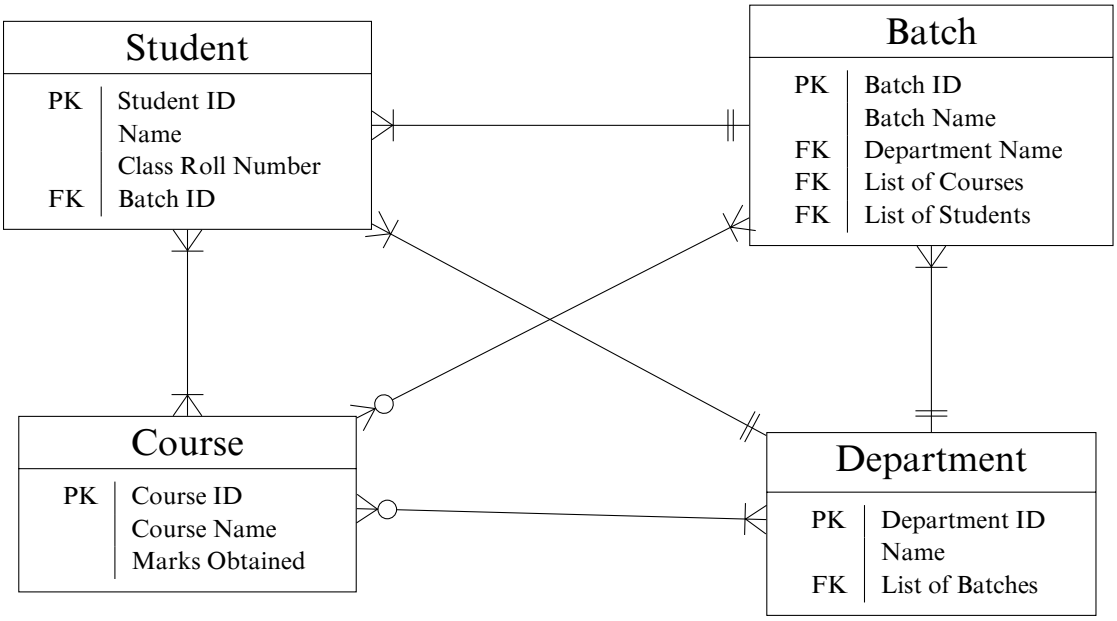
**`student.csv`**

| Student ID | Name | Class Roll No | Batch ID |
|---|---|---|---|
| ME1578 | Onkar Kuruvilla | H-69 | ME15 |
| ME0542 | Rhea Wable | H-43 | ME05 |
| ME0308 | Alisha Krishnan | G-94 | ME03 |
| ME2244 | Anay Solanki | A-31 | ME22 |
| CSE2021 | Indranil Kakar | F-79 | CSE20 |
| ME0498 | Lakshit Dugar | C-86 | ME04 |
| ECE0645 | Hridaan Deol | C-18 | ECE06 |
| CSE2198 | Hrishita Bhargava | F-93 | CSE21 |
| IT9244 | Saanvi Dua | E-77 | IT92 |
| ECE9898 | Kimaya Wason | B-05 | ECE98 |
| ME9842 | Mehul Seshadri | H-12 | ME98 |
| CSE1173 | Kaira Mandal | E-42 | CSE11 |
| ME9294 | Dhanuk Garg | A-54 | ME92 |
| IT0935 | Jivika Baria | B-33 | IT09 |
| ECE0520 | Urvi Wagle | D-54 | ECE05 |
| ME0540 | Vardaniya Hayer | C-48 | ME05 |
| CSE0331 | Rohan Dara | E-11 | CSE03 |
| CSE9251 | Sara Shah | G-53 | CSE92 |
| ECE1131 | Jayant Khosla | D-80 | ECE11 |
| ECE0339 | Yuvraj Subramaniam | E-13 | ECE03 |
| IT0800 | Zain Tak | C-42 | IT08 |

| ECE9839 | Advik Anne | D-11 | ECE98 |
|---|---|---|---|
| IT9213 | Onkar Mangal | B-53 | IT92 |
| ECE0587 | Saira Choudhry | H-64 | ECE05 |
| ECE9743 | Badal Badami | A-18 | ECE97 |
| IT9125 | Aarush Lanka | D-26 | IT91 |
| ME0933 | Ryan Vala | A-69 | ME09 |
| ME9479 | Adira Mangal | F-66 | ME94 |
| ME2131 | Samar Agrawal | G-69 | ME21 |
| ECE1819 | Romil Chowdhury | C-82 | ECE18 |
| IT0611 | Kiaan Sangha | F-58 | IT06 |
| CSE9545 | Anika Sabharwal | G-80 | CSE95 |
| IT8901 | Shalv Guha | C-09 | IT89 |
| IT1469 | Shamik Dayal | A-66 | IT14 |
| ECE1263 | Suhana Ghose | A-14 | ECE12 |
| ME1241 | Charvi Sule | E-75 | ME12 |
| ECE9712 | Ira Chanda | F-64 | ECE97 |
| CSE9940 | Siya Upadhyay | C-37 | CSE99 |
| IT0932 | Aarna Aggarwal | C-80 | IT09 |
| IT0755 | Rasha Balay | D-95 | IT07 |
| ECE1426 | Riaan Iyengar | E-08 | ECE14 |
| CSE0437 | Aayush Singh | A-08 | CSE04 |
| IT1818 | Yuvraj Bera | B-85 | IT18 |
| ME0939 | Misha Jani | H-71 | ME09 |
| ME0825 | Aarush Divan | G-17 | ME08 |
| CSE9944 | Shayak Hans | B-18 | CSE99 |
| ME1500 | Oorja Tandon | D-70 | ME15 |
| CSE0018 | Adah Seth | G-10 | CSE00 |
| ECE1707 | Samaira Yohannan | A-33 | ECE17 |
| ECE0320 | Aradhya Wadhwa | H-04 | ECE03 |
| IT1670 | Sara Swaminathan | H-63 | IT16 |
| ECE0569 | Siya Tak | A-98 | ECE05 |
| ECE0173 | Vihaan Ahluwalia | D-12 | ECE01 |
| ECE2069 | Vardaniya Chander | G-11 | ECE20 |
| IT1311 | Mishti Comar | C-77 | IT13 |
| ME9161 | Aarna Sha | C-65 | ME91 |
| CSE9810 | Shaan Sabharwal | D-79 | CSE98 |
| IT9161 | Mamooty Hayer | D-21 | IT91 |

| IT2220 | Rhea Bhattacharyya | G-18 | IT22 |
|---|---|---|---|
| ME0588 | Raunak Chaudry | B-72 | ME05 |
| IT1959 | Lakshit Sandhu | B-30 | IT19 |
| ME0563 | Taran Sarraf | H-11 | ME05 |
| IT9157 | Adah Khurana | D-36 | IT91 |
| ME9053 | Myra Ratta | B-32 | ME90 |
| ECE9634 | Damini Kata | B-48 | ECE96 |
| ECE9454 | Vritika Bhardwaj | D-98 | ECE94 |
| ME1508 | Mamooty Grewal | A-04 | ME15 |
| ECE0348 | Nayantara Kanda | E-26 | ECE03 |
| IT9174 | Shlok Sura | G-66 | IT91 |
| CSE9290 | Neelofar Ganesh | B-59 | CSE92 |
| ME1969 | Ivan Wali | F-45 | ME19 |
| ME9357 | Anvi Warrior | A-80 | ME93 |
| CSE0295 | Renee Goda | F-82 | CSE02 |
| ME1953 | Oorja Choudhury | A-79 | ME19 |
| ECE9994 | Krish Amble | B-81 | ECE99 |
| ECE1345 | Vanya Subramaniam | E-98 | ECE13 |
| IT1607 | Neelofar Buch | F-41 | IT16 |
| ME0479 | Emir Dhawan | E-56 | ME04 |
| IT1545 | Vivaan Sibal | E-94 | IT15 |
| CSE0045 | Kartik Joshi | B-22 | CSE00 |

# 3 E-R Diagram




# 4 Programs

**main.py**

```
#!/bin/python3
from tkinter import
 ↪  Tk,Frame,Button,Label,Entry,StringVar,DoubleVar,END
from tkinter.scrolledtext import ScrolledText
from PIL.Image import open as image_open
from PIL.ImageTk import PhotoImage
from texttable import Texttable
from matplotlib.pyplot import show
from re import compile
from functools import partial
#import modules
from student import
 ↪  create_student,update_student,remove_student,report
from course import create_course,course_performance,course_statistics
from batch import
 ↪  create_batch,students,courses,batch_performance,batch_statistics
from department import
 ↪  create_department,batches,batch_averages,department_statistics
from examination import Examination
#---
interface=Tk()
interface.resizable(False,False)
interface.title('Menu')
home_image=PhotoImage(image_open('images/home.png').resize((15,15)))
plus_image=PhotoImage(image_open('images/plus.ico').resize((15,15)))
minus_image=PhotoImage(image_open('images/minus.ico').resize((15,15)))
#button functions
def retrieve(var):
```

```
    val=var.get()
    if val=='':raise Error('Empty Entry')
    var.set('')
    return val
def add_marks():
    global course_row
    course_marks_input.append((
        roll_no:=StringVar(),
        student:=StringVar(),
        marks:=DoubleVar()
    ))
    marks_entries.extend((
        roll_entry:=Entry(course_creation,textvariable=roll_no),
        name_entry:=Entry(course_creation,textvariable=student),
        marks_entry:=Entry(course_creation,textvariable=marks)
    ))
    roll_entry.grid(column=0,row=course_row)
    name_entry.grid(column=1,row=course_row)
    marks_entry.grid(column=2,row=course_row)
    course_row+=1
    marks_add.grid_forget();marks_add.grid(column=1,row=course_row,st
     ↪  icky='e')
    marks_remove.grid_forget();marks_remove.grid(column=2,row=course_
     ↪  row,sticky='w')
    course_create.grid_forget();course_create.grid(columnspan=3,row=c
     ↪  ourse_row+1,sticky='nsew')
def add_courses():
    global students_row,courses_row
    batch_courses_input.append(course_id:=StringVar())
    course_entries.append(course_entry:=Entry(batch_creation,textvari
     ↪  able=course_id))
    course_entry.grid(column=0,row=courses_row)
    courses_row+=1;students_row+=1
    courses_add.grid_forget();courses_add.grid(column=0,row=courses_r
     ↪  ow,sticky='e')
    courses_remove.grid_forget();courses_remove.grid(column=1,row=cou
     ↪  rses_row,sticky='w')
    students_heading.grid_forget();students_heading.grid(columnspan=2
     ↪  ,row=courses_row+1,sticky='nsew')
    for i,student_entry in enumerate(student_entries,courses_row+2):
        student_entry.grid_forget()
        student_entry.grid(column=0,row=i)
    students_add.grid_forget();students_add.grid(column=0,row=student
     ↪  s_row,sticky='e')
    students_remove.grid_forget();students_remove.grid(column=1,row=s
     ↪  tudents_row,sticky='w')
    batch_create.grid_forget();batch_create.grid(columnspan=2,row=stu
     ↪  dents_row+1,sticky='nsew')
def add_students():
    global students_row
    batch_students_input.append(student_id:=StringVar())
    student_entries.append(student_entry:=Entry(batch_creation,textva
     ↪  riable=student_id))
    student_entry.grid(column=0,row=students_row)
```

```
    students_row+=1
    students_add.grid_forget();students_add.grid(column=0,row=student
     ↪  s_row,sticky='e')
    students_remove.grid_forget();students_remove.grid(column=1,row=s
     ↪  tudents_row,sticky='w')
    batch_create.grid_forget();batch_create.grid(columnspan=2,row=stu
     ↪  dents_row+1,sticky='nsew')
def add_batches():
    global batches_row
    department_batch_input.append(batch_id:=StringVar())
    batch_entries.append(batch_entry:=Entry(department_creation,textv
     ↪  ariable=batch_id))
    batch_entry.grid(columnspan=2,row=batches_row)
    batches_row+=1
    batch_add.grid_forget();batch_add.grid(column=0,row=batches_row,s
     ↪  ticky='e')
    batch_remove.grid_forget();batch_remove.grid(column=1,row=batches
     ↪  _row,sticky='w')
    department_create.grid_forget();department_create.grid(columnspan
     ↪  =2,row=batches_row+1,sticky='nsew')
def add_batches_for_exam():
    global exam_batch_row
    exam_batch_input.append(batch_id:=StringVar())
    exam_batch_entries.append(batch_entry:=Entry(hold_exam,textvariab
     ↪  le=batch_id))
    batch_entry.grid(columnspan=2,row=exam_batch_row)
    exam_batch_row+=1
    exam_batches_add.grid_forget();exam_batches_add.grid(column=0,row
     ↪  =exam_batch_row,sticky='e')
    exam_batches_remove.grid_forget();exam_batches_remove.grid(column
     ↪  =1,row=exam_batch_row,sticky='w')
    start_exam.grid_forget();start_exam.grid(columnspan=2,row=exam_ba
     ↪  tch_row+1,sticky='nsew')
course_id_pattern=compile('^C0[0-9]{2}$')
batch_id_pattern=compile('^[A-Z]+[0-9]{2}$')
batch_name_pattern=compile('^[A-Z]+ (19|20)[0-9]{2}-(19|20)[0-9]{2}$')
def course_resolve(func):
    course=retrieve(course_name)
    if course_id_pattern.search(course)==None:
        return func(course_name=course)
    else:
        return func(course_id=course)
def clean_entries(entry_list):
    for i in entry_list:i.grid_forget()
    entry_list.clear()
def view_course_performance():
    sheet=Texttable()
    sheet.set_cols_align(('l','l','r'))
    sheet.add_row(['Class Roll','Name','Marks'])
    for roll,name,marks in course_resolve(course_performance):sheet.a
     ↪  dd_row([roll,name,marks])
    show_performance.configure(state='normal')
    show_performance.delete(0.0,END)
    show_performance.insert(0.0,sheet.draw())
```

```
    show_performance.configure(state='disabled')
def batch_resolve(func):
    batch=retrieve(batch_name)
    if batch_id_pattern.search(batch)!=None:
        return func(batch_id=batch)
    elif batch_name_pattern.search(batch)!=None:
        return func(batch_name=batch)
    else:
        raise Error('Not a valid batch name')
def view_batch_list(func,widget):
    widget.configure(state='normal')
    widget.delete(0.0,END)
    widget.insert(0.0,'\n'.join(batch_resolve(func)))
    widget.configure(state='disabled')
def view_student_average():
    sheet=Texttable()
    sheet.set_cols_align(['l','l','r'])
    sheet.add_row(['Student','Name','Percentage'])
    for roll,name,percentage in batch_resolve(batch_performance):
        sheet.add_row([roll,name,f'{percentage:.2f}%'])
    show_student_average.configure(state='normal')
    show_student_average.delete(0.0,END)
    show_student_average.insert(0.0,sheet.draw())
    show_student_average.configure(state='disabled')
def view_department_batches():
    show_batches.configure(state='normal')
    show_batches.delete(0.0,END)
    show_batches.insert(0.0,'\n'.join(batches(department_id=retrieve(
     ↪  department_id))))
    show_batches.configure(state='disabled')
def view_department_performance():
    sheet=Texttable()
    sheet.set_cols_align(['l','r'])
    sheet.add_row(['Batch','Average'])
    for batch,percentage in
     ↪  batch_averages(department_id=retrieve(department_id)):
        sheet.add_row([batch,f'{percentage:.2f}%'])
    show_averages.configure(state='normal')
    show_averages.delete(0.0,END)
    show_averages.insert(0.0,sheet.draw())
    show_averages.configure(state='disabled')
def exam():
    def get_marks(papers):
        for paper in papers:
            batch_label.configure(text=paper.batch)
            student_label.configure(text=paper.roll_no)
            course_label.configure(text=f'Marks in {paper.course}')
            accept_marks.wait_variable(marks_input)
            yield paper,float(marks_input.get())
    def view_student_performance():
        chart=Texttable()
        chart.set_cols_align(('l','r'))
        chart.add_row(['Student ID','Average'])
        for student,average in
         ↪  examination.student_performance.items():
```

```
            chart.add_row([student,average])
        show_exam_performance.configure(state='normal')
        show_exam_performance.delete(0.0,END)
        show_exam_performance.insert(0.0,chart.draw())
        show_exam_performance.configure(state='disabled')
    exam_title=f'{retrieve(exam_name)} Exam'
    examination=Examination(exam_title,*[i.get() for i in
     ↪  exam_batch_input])
    interface.title(exam_title)
    exam_batch_input.clear()
    clean_entries(exam_batch_entries)
    hold_exam.pack_forget()
    provide_marks.pack()
    examination.enter_marks(get_marks(examination.take_exam()))
    #After exam
    post_exam=Frame(interface)
    Button(post_exam,image=home_image,command=lambda:(post_exam.pack_
     ↪  forget(),menu.pack())).grid(row=0)
    Button(post_exam,text='View Exam
     ↪  Results',command=view_student_performance).grid(row=1)
    Button(post_exam,text='View Exam Scatter Plot',command=lambda:(ex
     ↪  amination.statistics(),show())).grid(row=2)
    (show_exam_performance:=ScrolledText(post_exam)).grid(row=3);show
     ↪  _exam_performance.configure(state='disabled')
    provide_marks.pack_forget()
    post_exam.pack()
    interface.title('Results')
#menu
menu=Frame(interface)
    #student
Button(menu,text='Create Student',command=lambda:(menu.pack_forget(),
    student_creation.pack(),interface.title('Create
 ↪  Student'))).grid(column=0,row=0,sticky='nsew')
Button(menu,text='Update Student',command=lambda:(menu.pack_forget(),
    student_update.pack(),interface.title('Update
 ↪  Student'))).grid(column=0,row=1,sticky='nsew')
Button(menu,text='Remove Student',command=lambda:(menu.pack_forget(),
    student_removal.pack(),interface.title('Remove
 ↪  Student'))).grid(column=0,row=2,sticky='nsew')
Button(menu,text='Generate Report',command=lambda:(menu.pack_forget()
    ,report_generation.pack(),interface.title('Generate
 ↪  Report'))).grid(column=0,row=3,sticky='nsew')
    #course
Button(menu,text='Create Course',command=lambda:(menu.pack_forget(),c
    ourse_creation.pack(),interface.title('Create
 ↪  Course'))).grid(column=1,row=0,sticky='nsew')
Button(menu,text='View Course Performance',command=lambda:(menu.pack_
    forget(),course_perform.pack(),interface.title('Course
 ↪  Performance'))).grid(column=1,row=1,sticky='nsew')
Button(menu,text='Course Statistics',command=lambda:(menu.pack_forget
    (),course_statisticize.pack(),interface.title('Course
 ↪  Statistics'))).grid(column=1,row=2,sticky='nsew')
    #batch
```

```
Button(menu,text='Create Batch',command=lambda:(menu.pack_forget(),batch_creation.pack(),interface.title('Create Batch'))).grid(column=2,row=0,sticky='nsew')
Button(menu,text='View Batch Students',command=lambda:(menu.pack_forget(),batch_students.pack(),interface.title('Batch Students'))).grid(column=2,row=1,sticky='nsew')
Button(menu,text='View Batch Courses',command=lambda:(menu.pack_forget(),batch_courses.pack(),interface.title('Batch Courses'))).grid(column=2,row=2,sticky='nsew')
Button(menu,text='View Batch Performance',command=lambda:(menu.pack_forget(),batch_performed.pack(),interface.title('Batch Performance'))).grid(column=2,row=3,sticky='nsew')
Button(menu,text='Batch Pie Chart',command=lambda:(menu.pack_forget(),batch_statisticize.pack(),interface.title('Batch Pie Chart'))).grid(column=2,row=4,sticky='nsew')
    #department
Button(menu,text='Create Department',command=lambda:(menu.pack_forget(),department_creation.pack(),interface.title('Create Department'))).grid(column=3,row=0,sticky='nsew')
Button(menu,text='View Department Batches',command=lambda:(menu.pack_forget(),department_batches.pack(),interface.title('Department Batches'))).grid(column=3,row=1,sticky='nsew')
Button(menu,text='View Department Performance',command=lambda:(menu.pack_forget(),department_performance.pack(),interface.title('Department Performance'))).grid(column=3,row=2,sticky='nsew')
Button(menu,text='Department Line Plot',command=lambda:(menu.pack_forget(),department_statisticize.pack(),interface.title('Department Line Plot'))).grid(column=3,row=3,sticky='nsew')
    #examination
Button(menu,text='Take Exam',command=lambda:(menu.pack_forget(),hold_exam.pack(),interface.title('Hold Exam'))).grid(column=0,columnspan=4,row=5,sticky='nsew')
#entry variables
student_id=StringVar();student_name=StringVar();roll_no=StringVar();batch_id=StringVar()
course_id=StringVar();course_name=StringVar()
batch_id=StringVar();batch_name=StringVar();
department_id=StringVar();department_name=StringVar()
exam_name=StringVar();marks_input=DoubleVar()
#create Student
student_creation=Frame(interface)
Button(student_creation,image=home_image,command=lambda:(student_creation.pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=0,row=0,sticky='e')
Label(student_creation,text='Student ID:').grid(column=0,row=1,sticky='e')
Entry(student_creation,textvariable=student_id).grid(column=1,row=1,sticky='w')
Label(student_creation,text='Student Name:').grid(column=0,row=2,sticky='e')
```

```
Entry(student_creation,textvariable=student_name).grid(column=1,row=2
 ↪  ,stick='w')
Label(student_creation,text='Class Roll
 ↪  Number').grid(column=0,row=3,sticky='e')
Entry(student_creation,textvariable=roll_no).grid(column=1,row=3,stic
 ↪  k='w')
Label(student_creation,text='Batch
 ↪  ID:').grid(column=0,row=4,sticky='e')
Entry(student_creation,textvariable=batch_id).grid(column=1,row=4,sti
 ↪  ck='w')
Button(student_creation,text='Create',command=lambda:
    create_student(
        student_id=retrieve(student_id),
        name=retrieve(student_name),
        class_roll_no=retrieve(roll_no),
        batch=retrieve(batch_id)
    )
).grid(row=5,columnspan=2,sticky='nsew')
#update Student
student_update=Frame(interface)
Button(student_update,image=home_image,command=lambda:(student_update
    .pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=
 ↪  0,row=0,sticky='e')
Label(student_update,text='Student
 ↪  ID:').grid(column=0,row=1,sticky='e')
Entry(student_update,textvariable=student_id).grid(column=1,row=1,sti
 ↪  ck='w')
Label(student_update,text='Student
 ↪  Name:').grid(column=0,row=2,sticky='e')
Entry(student_update,textvariable=student_name).grid(column=1,row=2,s
 ↪  tick='w')
Label(student_update,text='Class Roll
 ↪  Number').grid(column=0,row=3,sticky='e')
Entry(student_update,textvariable=roll_no).grid(column=1,row=3,stick=
 ↪  'w')
Button(student_update,text='Update',command=lambda:
    update_student(
        student_id=retrieve(student_id),
        name=retrieve(student_name),
        class_roll_no=retrieve(roll_no)
    )
).grid(row=4,columnspan=2,sticky='nsew')
#remove Student
student_removal=Frame(interface)
Button(student_removal,image=home_image,command=lambda:(student_remov
    al.pack_forget(),menu.pack(),interface.title('Menu'))).grid(colum
 ↪  n=0,row=0,sticky='e')
Label(student_removal,text='Student
 ↪  ID:').grid(column=0,row=1,sticky='e')
Entry(student_removal,textvariable=student_id).grid(column=1,row=1,st
 ↪  ick='w')
Button(student_removal,text='Remove',command=lambda:remove_student(re
 ↪  trieve(student_id))).grid(row=2,columnspan=2,sticky='nsew')
```

```
#report Student
report_generation=Frame(interface)
Button(report_generation,image=home_image,command=lambda:(report_gene
    ration.pack_forget(),menu.pack(),interface.title('Menu'))).grid(c
 ⇉  olumn=0,row=0,sticky='e')
Label(report_generation,text='Student
 ↪  ID:').grid(column=0,row=1,sticky='e')
Entry(report_generation,textvariable=student_id).grid(column=1,row=1,
 ↪  stick='w')
Button(report_generation,text='Generate Report',command=lambda:
    report(retrieve(student_id))
).grid(row=2,columnspan=2,sticky='nsew')
#create Course
course_creation=Frame(interface)
course_marks_input=[]
marks_entries=[]
Button(course_creation,image=home_image,command=lambda:(course_creati
    on.pack_forget(),menu.pack(),interface.title('Menu'))).grid(colum
 ⇉  n=0,row=0,sticky='e')
Label(course_creation,text='Course
 ↪  ID:').grid(column=0,columnspan=2,row=1,sticky='e')
Entry(course_creation,textvariable=course_id).grid(column=2,row=1,sti
 ↪  ck='w')
Label(course_creation,text='Course
 ↪  Name').grid(column=0,columnspan=2,row=2,sticky='e')
Entry(course_creation,textvariable=course_name).grid(column=2,row=2,s
 ↪  ticky='w')
Label(course_creation,text='Class Roll
 ↪  No').grid(column=0,row=3,sticky='nsew')
Label(course_creation,text='Student
 ↪  Name').grid(column=1,row=3,sticky='nsew')
Label(course_creation,text='Marks').grid(column=2,row=3,sticky='nsew')
course_row=4
(marks_add:=Button(course_creation,image=plus_image,command=add_marks
 ↪  )).grid(column=1,row=4,sticky='e')
(marks_remove:=Button(course_creation,image=minus_image,command=lambd
    a:(course_marks_input.pop(),marks_entries.pop().grid_forget(),mar
 ⇉  ks_entries.pop().grid_forget()))).grid(column=2,row=4,sticky='w')
(course_create:=Button(course_creation,text='Create',command=lambda:(
    create_course(
        course_id=retrieve(course_id),
        course_name=retrieve(course_name),
        marks=[{
            'roll number':retrieve(roll_val),
            'name':retrieve(name_val),
            'marks':retrieve(marks_val)
        } for roll_val,name_val,marks_val in course_marks_input]
    ),
    [entry.grid_forget() for entry in marks_entries],
    marks_entries.clear(),
    course_marks_input.clear()
))).grid(columnspan=3,row=5,sticky='nsew')
#performance Course
course_perform=Frame(interface)
```

```
Button(course_perform,image=home_image,command=lambda:(course_perform
    .pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=
 ↪  0,row=0,sticky='e')
Label(course_perform,text='Course:').grid(column=0,row=1,sticky='e')
Entry(course_perform,textvariable=course_name).grid(column=1,row=1,st
 ↪  icky='w')
Button(course_perform,text='View',command=view_course_performance).gr
 ↪  id(columnspan=2,row=2,sticky='nsew')
show_performance=ScrolledText(course_perform,width=60,height=10);show
    _performance.grid(columnspan=2,row=3,sticky='nsew');show_performa
 ↪  nce.configure(state='disabled')
#statisticize course
course_statisticize=Frame(interface)
Button(course_statisticize,image=home_image,command=lambda:(course_st
    atisticize.pack_forget(),menu.pack(),interface.title('Menu'))).gr
 ↪  id(column=0,row=0,sticky='e')
Label(course_statisticize,text='Course:').grid(column=0,row=1,sticky=
 ↪  'e')
Entry(course_statisticize,textvariable=course_name).grid(column=1,row
 ↪  =1,sticky='w')
Button(course_statisticize,text='View',command=lambda:(course_resolve
    (course_statistics),show())).grid(columnspan=2,row=2,sticky='nsew
 ↪  ')
#create Batch
batch_creation=Frame(interface)
courses_row=5;students_row=7
batch_courses_input=[];batch_students_input=[]
course_entries=[];student_entries=[]
Button(batch_creation,image=home_image,command=lambda:(batch_creation
    .pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=
 ↪  0,row=0,sticky='e')
Label(batch_creation,text='Batch ID:').grid(column=0,row=1,sticky='e')
Entry(batch_creation,textvariable=batch_id).grid(column=1,row=1,stick
 ↪  y='w')
Label(batch_creation,text='Batch
 ↪  Name:').grid(column=0,row=2,sticky='e')
Entry(batch_creation,textvariable=batch_name).grid(column=1,row=2,sti
 ↪  cky='w')
Label(batch_creation,text='Department
 ↪  ID:').grid(column=0,row=3,sticky='e')
Entry(batch_creation,textvariable=department_name).grid(column=1,row=
 ↪  3,sticky='w')
Label(batch_creation,text='Courses').grid(columnspan=2,row=4,sticky='
 ↪  nsew')
(courses_add:=Button(batch_creation,image=plus_image,command=add_cour
 ↪  ses)).grid(column=0,row=5,sticky='e')
(courses_remove:=Button(batch_creation,image=minus_image,command=lamb
    da:(course_entries.pop().grid_forget(),batch_courses_input.pop())
 ↪  )).grid(column=1,row=5,sticky='w')
(students_heading:=Label(batch_creation,text='Students')).grid(column
 ↪  span=2,row=6,sticky='nsew')
```

```
(students_add:=Button(batch_creation,image=plus_image,command=add_students)).grid(column=0,row=7,sticky='e')
(students_remove:=Button(batch_creation,image=minus_image,command=lambda:(student_entries.pop().grid_forget(),batch_students_input.pop())())).grid(column=1,row=7,sticky='w')
(batch_create:=Button(batch_creation,text='Create',command=lambda:(
    create_batch(
        batch_id=retrieve(batch_id),
        batch_name=retrieve(batch_name),
        department_name=retrieve(department_name),
        courses=[retrieve(i) for i in batch_courses_input],
        students=[retrieve(i) for i in batch_students_input]
    ),
    batch_courses_input.clear(),
    batch_students_input.clear(),
    clean_entries(course_entries),
    clean_entries(student_entries)
))).grid(columnspan=2,row=8,sticky='nsew')
#batch students
batch_students=Frame(interface)
Button(batch_students,image=home_image,command=lambda:(batch_students.pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=0,row=0,sticky='e')
Label(batch_students,text='Batch:').grid(column=0,row=1,sticky='e')
Entry(batch_students,textvariable=batch_name).grid(column=1,row=1,sticky='w')
(show_students:=ScrolledText(batch_students,width=10,height=3)).grid(columnspan=2,row=3,sticky='nsew');show_students.configure(state='disabled')
Button(batch_students,text='View',command=partial(view_batch_list,students,show_students)).grid(columnspan=2,row=2,sticky='nsew')
#batch courses
batch_courses=Frame(interface)
Button(batch_courses,image=home_image,command=lambda:(batch_courses.pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=0,row=0,sticky='e')
Label(batch_courses,text='Batch:').grid(column=0,row=1,sticky='e')
Entry(batch_courses,textvariable=batch_name).grid(column=1,row=1,sticky='w')
(show_courses:=ScrolledText(batch_courses,width=10,height=5)).grid(columnspan=2,row=3,sticky='nsew');show_courses.configure(state='disabled')
Button(batch_courses,text='View',command=partial(view_batch_list,courses,show_courses)).grid(columnspan=2,row=2,sticky='nsew')
#batch performance
batch_performed=Frame(interface)
Button(batch_performed,image=home_image,command=lambda:(batch_performed.pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=0,row=0,sticky='e')
Label(batch_performed,text='Batch:').grid(column=0,row=1,sticky='e')
Entry(batch_performed,textvariable=batch_name).grid(column=1,row=1,sticky='w')
```

```
Button(batch_performed,text='View',command=view_student_average).grid
 ↪  (columnspan=2,row=2,sticky='nsew')
(show_student_average:=ScrolledText(batch_performed,width=50,height=1
    0)).grid(columnspan=2,row=3,sticky='nsew');show_student_average.c
 ↪  onfigure(state='disabled')
#batch statisticize
batch_statisticize=Frame(interface)
Button(batch_statisticize,image=home_image,command=lambda:(batch_stat
    isticize.pack_forget(),menu.pack(),interface.title('Menu'))).grid
 ↪  (column=0,row=0,sticky='e')
Label(batch_statisticize,text='Batch:').grid(column=0,row=1,sticky='e
 ↪  ')
Entry(batch_statisticize,textvariable=batch_name).grid(column=1,row=1
 ↪  ,sticky='w')
Button(batch_statisticize,text='View',command=lambda:(batch_resolve(b
 ↪  atch_statistics),show())).grid(columnspan=2,row=2,sticky='nsew')
#create Department
department_creation=Frame(interface)
batch_entries=[]
department_batch_input=[]
Button(department_creation,image=home_image,command=lambda:(departmen
    t_creation.pack_forget(),menu.pack(),interface.title('Menu'))).gr
 ↪  id(column=0,row=0,sticky='e')
Label(department_creation,text='Department
 ↪  ID:').grid(column=0,row=1,sticky='e')
Entry(department_creation,textvariable=department_id).grid(column=1,r
 ↪  ow=1,sticky='w')
Label(department_creation,text='Department
 ↪  Name:').grid(column=0,row=2,sticky='e')
Entry(department_creation,textvariable=department_name).grid(column=1
 ↪  ,row=2,sticky='w')
Label(department_creation,text='Batches').grid(columnspan=2,row=3,sti
 ↪  cky='nsew')
batches_row=4
(batch_add:=Button(department_creation,image=plus_image,command=add_b
 ↪  atches)).grid(column=0,row=4,sticky='e')
(batch_remove:=Button(department_creation,image=minus_image,command=l
    ambda:(batch_entries.pop().grid_forget(),department_batch_input.p
 ↪  op()))).grid(column=1,row=4,sticky='w')
(department_create:=Button(department_creation,text='Create',command=
 ↪  lambda:(
    create_department(
        department_id=retrieve(department_id),
        department_name=retrieve(department_name),
        batches=[retrieve(i) for i in department_batch_input]
    ),
    department_batch_input.clear(),
    clean_entries(batch_entries)
))).grid(columnspan=2,row=5,sticky='nsew')
#department batches
department_batches=Frame(interface)
```

```
Button(department_batches,image=home_image,command=lambda:(department_batches.pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=0,row=0,sticky='e')
Label(department_batches,text='Department ID:').grid(column=0,row=1,sticky='e')
Entry(department_batches,textvariable=department_id).grid(column=1,row=1,sticky='w')
Button(department_batches,text='View',command=view_department_batches).grid(columnspan=2,row=2,sticky='nsew')
(show_batches:=ScrolledText(department_batches,width=10,height=8)).grid(columnspan=2,row=3,sticky='nsew');show_batches.configure(state='disabled')
#department performance
department_performance=Frame(interface)
Button(department_performance,image=home_image,command=lambda:(department_performance.pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=0,row=0,sticky='e')
Label(department_performance,text='Department ID:').grid(column=0,row=1,sticky='e')
Entry(department_performance,textvariable=department_id).grid(column=1,row=1,sticky='w')
Button(department_performance,text='View',command=view_department_performance).grid(columnspan=2,row=2,sticky='nsew')
(show_averages:=ScrolledText(department_performance,width=10,height=10)).grid(columnspan=2,row=3,sticky='nsew');show_averages.configure(state='disabled')
#department statisticize
department_statisticize=Frame(interface)
Button(department_statisticize,image=home_image,command=lambda:(department_statisticize.pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=0,row=0,sticky='e')
Label(department_statisticize,text='Department ID:').grid(column=0,row=1,sticky='e')
Entry(department_statisticize,textvariable=department_id).grid(column=1,row=1,sticky='w')
Button(department_statisticize,text='View',command=lambda:(
    department_statistics(department_id=retrieve(department_id)),
    show()
)).grid(columnspan=2,row=2,sticky='nsew')
#hold exam
exam_batch_input=[]
exam_batch_entries=[]
hold_exam=Frame(interface)
Button(hold_exam,image=home_image,command=lambda:(hold_exam.pack_forget(),menu.pack(),interface.title('Menu'))).grid(column=0,row=0,sticky='e')
Label(hold_exam,text='Examination:').grid(column=0,row=1,sticky='e')
Entry(hold_exam,textvariable=exam_name).grid(column=1,row=1,sticky='w')
Label(hold_exam,text='Batches').grid(columnspan=2,row=2,sticky='nsew')
exam_batch_row=3
```

```
(exam_batches_add:=Button(hold_exam,image=plus_image,command=add_batc
 ↪  hes_for_exam)).grid(column=0,row=3,sticky='e')
(exam_batches_remove:=Button(hold_exam,image=minus_image,command=lamb
    da:(exam_batch_input.pop(),exam_batch_entries.pop().grid_forget()
 ⇉  ))).grid(column=1,row=3,sticky='w')
(start_exam:=Button(hold_exam,text='Start
 ↪  Exam',command=exam)).grid(columnspan=2,row=4,sticky='nsew')
#take exam
provide_marks=Frame(interface)
Label(provide_marks,text='Batch: ').grid(column=0,row=0)
Label(provide_marks,text='Student: ').grid(column=0,row=1)
(batch_label:=Label(provide_marks)).grid(column=1,row=0)
(student_label:=Label(provide_marks)).grid(column=1,row=1)
(course_label:=Label(provide_marks)).grid(column=0,row=2)
(exam_marks_entry:=Entry(provide_marks)).grid(column=1,row=2)
(accept_marks:=Button(provide_marks,text='Enter',command=lambda:(mark
    s_input.set(exam_marks_entry.get()),exam_marks_entry.delete(0,END
 ⇉  )))).grid(columnspan=2,row=3)
#---
menu.pack()
interface.mainloop()
```

**student.py**

```
from csv import writer,reader
from texttable import Texttable
def create_student(**kwargs):
    batch_id=kwargs['batch']
    student_id=kwargs['student_id']
    with open('databases/student.csv','a') as csvfile:
        writer(csvfile).writerow([
            student_id,
            kwargs['name'],
            kwargs['class_roll_no'],
            batch_id
        ])
    rows=[]
    with open('databases/batch.csv','r') as csvfile:
        for row in reader(csvfile):
            if row[0]==batch_id:
                row[4]+=f':{student_id}'
            rows.append(row)
    with open('databases/batch.csv','w') as csvfile:
        db=writer(csvfile)
        for row in rows:
            db.writerow(row)
def update_student(**kwargs):#update by student id
    rows=[]
    EXIT_CODE=1
    with open('databases/student.csv','r') as csvfile:
        db=reader(csvfile)
        for row in db:
            if row[0]==kwargs['student_id']:
                EXIT_CODE=0
```

```
                rows.append([
                    row[0],
                    kwargs['name'] if 'name' in kwargs else row[1],
                    kwargs['class_roll_no'] if 'class_roll_no' in
                     ↪  kwargs else row[2],
                    kwargs['student_id'][:-2]
                ])
                break
            rows.append(row)
        for row in db:rows.append(row)#add remaining
    with open('databases/student.csv','w') as csvfile:#update file
        db=writer(csvfile)
        for row in rows:db.writerow(row)
    return EXIT_CODE
def remove_student(student_id):#remove by student id
    rows=[]
    EXIT_CODE=1
    with open('databases/student.csv','r') as csvfile:
        db=reader(csvfile)
        for row in db:
            if row[0]==student_id:#found
                batch_id=row[3]
                EXIT_CODE=0
                break
            rows.append(row)
        for row in db:rows.append(row)#add remaining
    with open('databases/student.csv','w') as csvfile:#update file
        db=writer(csvfile)
        for row in rows:db.writerow(row)
    if EXIT_CODE==1:return 1#student not found
    rows=[]
    empty_batch=False
    with open('databases/batch.csv','r') as csvfile:
        db=reader(csvfile)
        for row in db:
            if row[0]==batch_id:
                students=row[4].split(':')
                students.remove(student_id)
                courses=row[3].split(':')
                if len(students)==0:
                    empty_batch=True
                    department_name=row[2]
                else:
                    row[4]=':'.join(students)
                    rows.append(row)
                break
            rows.append(row)
        for row in db:rows.append(row)
    with open('databases/batch.csv','w') as csvfile:
        db=writer(csvfile)
        for row in rows:db.writerow(row)
    rows=[]
    with open('databases/course.csv','r') as csvfile:
        db=reader(csvfile)
        for row in db:
            if row[0] in courses:
                try:
```

```
                    marks=row[2]
                    a=marks.index(student_id)
                    b=marks.find('-',a)
                    row[2]=marks[:a-1]+marks[b:]
                except ValueError:#no marks given
                    continue
            rows.append(row)
    with open('databases/course.csv','w') as csvfile:
        db=writer(csvfile)
        for row in rows:db.writerow(row)
    if not empty_batch:return 0
    rows=[]
    with open('databases/department.csv','r') as csvfile:
        db=reader(csvfile)
        for row in db:
            if row[0]==department_name:
                batches=row[2].split(':')
                batches.remove(batch_id)
                row[2]=':'.join(batches)
                rows.append(row)
                break
            rows.append(row)
        for row in db:rows.append(row)
    with open('databases/department.csv','w') as csvfile:
        db=writer(csvfile)
        for row in rows:db.writerow(row)
def report(student_id):
    def grade(marks):
        if marks>=90:grade='A'
        elif marks>=80:grade='B'
        elif marks>=70:grade='C'
        elif marks>=60:grade='D'
        elif marks>=50:grade='E'
        else: return 'F','Failed'
        return (grade,'Passed')
    EXIT_CODE=1
    with open('databases/student.csv') as csvfile:
        db=reader(csvfile)
        for row in db:
            if row[0]==student_id:
                _,name,roll,batch_id=row
                EXIT_CODE=0
                break
    if EXIT_CODE==1:return 1
    with open('databases/batch.csv') as csvfile:
        db=reader(csvfile)
        for row in db:
            if row[0]==batch_id:
                exams=row[3].split(':')
                break
    marksheet=Texttable()
    marksheet.set_cols_align(('l','l','r','r','c','l'))
    marksheet.add_row(['Course','Course Id','Marks Obtained','Full
    ↪ Marks','Grade','Remarks'])
    total=0
    with open('databases/course.csv') as csvfile:
        db=reader(csvfile)
```

```
        for row in db:
            if row[0] in exams:
                performance=row[2]
                i=performance.index(student_id)
                a=performance.find(':',i)
                b=performance.find('-',i)
                marks=float(performance[a+1:b])
                total+=marks
                marksheet.add_row([
                    row[1],
                    row[0],
                    marks,
                    100,
                    *grade(marks)
                ])
    number=len(exams)
    marksheet.add_row(['Total','-',total,number*100,*grade(total/numb
     ↪ er)])
    with open(f'outputs/{student_id}-report_card.txt','w') as
     ↪ report:report.write(f'''
{name} ({roll})
{marksheet.draw()}
ID:{student_id}
Batch:{batch_id}
 ''')
    return EXIT_CODE
```

**course.py**

```
from csv import reader,writer
from collections import namedtuple
from matplotlib.pyplot import
 ↪ hist,title,xlabel,ylabel,xticks,xlim,style,close,savefig
Student=namedtuple("Student",('roll','name','marks'))
def _parse_args(argdict):
    wrong_arg=Exception('Either provide course_id or course_name')
    if len(argdict)>1:raise wrong_arg
    (param,val),=argdict.items()
    if param=='course_id':rown=0
    elif param=='course_name':rown=1
    else:raise wrong_arg
    return rown,val
def create_course(**kwargs):
    marks=''
    batches=set()
    course_id=kwargs['course_id']
    with open('databases/student.csv','r') as csvfile:
        db=reader(csvfile)
        for student_data in kwargs['marks']:
            roll=student_data['roll number']
            for row in db:
                if row[2]==roll:
                    student_id=row[0]
                    marks+=f"{student_id}:{student_data['marks']}-"
                    batches.add(student_id[0:-2])
```

```
                    csvfile.seek(0)
                    break
    with open('databases/course.csv','a') as csvfile:
        writer(csvfile).writerow([
            course_id,
            kwargs['course_name'],
            marks[:-1]#skip last '-'
        ])
    rows=[]
    with open('databases/batch.csv','r') as csvfile:
        for row in reader(csvfile):
            if row[0] in batches:
                row[3]+=':'+course_id
            rows.append(row)
    with open('databases/batch.csv','w') as csvfile:
        db=writer(csvfile)
        for row in rows:db.writerow(row)
def course_performance(**kwargs):
    rown,val=_parse_args(kwargs)
    marks=False
    with open('databases/course.csv','r') as csvfile:
        for row in reader(csvfile):
            if row[rown]==val and (perf:=row[2]):
                marks=perf.split('-')
                break
    if not marks:return -1
    with open('databases/student.csv','r') as csvfile:
        db=reader(csvfile)
        for perf in marks:
            student_id,mark=perf.split(':')
            for row in db:
                if row[0]==student_id:
                    yield Student(row[2],row[1],float(mark))
                    csvfile.seek(0)
                    break
def course_statistics(**kwargs):
    close()
    rown,val=_parse_args(kwargs)
    marks=False
    with open('databases/course.csv','r') as csvfile:
        for row in reader(csvfile):
            if row[rown]==val:
                performance=row[2]
                if performance=='':return -1
                marks=[float(i[i.index(':')+1:]) for i in
                 ↪  performance.split('-')]
                break
    if not marks:return -1
    style.use('Solarize_Light2')
    hist(marks,bins=[0,50,60,70,80,90,100])
    title(val)
    xlabel('marks')
    ylabel('number of students')
    xticks([25,55,65,75,85,95],['F','E','D','C','B','A'])
    xlim(100,0)
    savefig(f'outputs/Course Statistics-{val}.pdf')
```

```
from csv import reader,writer
from functools import partial
from collections import namedtuple
from matplotlib.pyplot import
 ↪  pie,title,style,xticks,yticks,close,savefig
Student=namedtuple("Student",('roll','name','percentage'))
def _parse_args(argdict):
    wrong_arg=Exception('Either provide batch_id or batch_name')
    if len(argdict)>1:raise wrong_arg
    (param,val),=argdict.items()
    if param=='batch_id':rown=0
    elif param=='batch_name':rown=1
    else:raise wrong_arg
    return rown,val
def _direct_list(col,**kwargs):
    rown,val=_parse_args(kwargs)
    with open('databases/batch.csv','r') as csvfile:
        for row in reader(csvfile):
            if row[rown]==val:
                return row[col].split(':')
    return -1
def create_batch(**kwargs):
    with open('databases/batch.csv','a') as csvfile:
        writer(csvfile).writerow([
            kwargs['batch_id'],
            kwargs['batch_name'],
            kwargs['department_name'],
            ':'.join(kwargs['courses']),
            ':'.join(kwargs['students'])
        ])
students=partial(_direct_list,4)
courses=partial(_direct_list,3)
def batch_performance(**kwargs):
    rown,val=_parse_args(kwargs)
    students=[];exams=[]
    with open('databases/batch.csv','r') as csvfile:
        for row in reader(csvfile):
            if row[rown]==val:
                students=row[4].split(':')
                exams=row[3].split(':')
                break
    if not students and not exams:return -1
    lexams=len(exams)
    with open('databases/student.csv','r') as
     ↪  studentcsv,open('databases/course.csv') as csvfile:
        courses=reader(csvfile)
        for row in reader(studentcsv):
            student_id=row[0]
            if student_id in students:
                total=0
                for course in courses:
                    if course[0] in exams:
                        marks=course[2]
                        i=marks.index(student_id)
                        a=marks.find(':',i)
```

```
                    b=marks.find('-',i)
                    total+=float(marks[a+1:b])
                csvfile.seek(0)
                yield Student(row[2],row[1],total/lexams)
def batch_statistics(**kwargs):
    close()
    slices,roll_numbers=[],[]
    for student in batch_performance(**kwargs):
        slices.append(student.percentage)
        roll_numbers.append(student.roll)
    name=tuple(kwargs.values())[0]
    title(name)
    xticks([],[])
    yticks([],[])
    style.use('Solarize_Light2')
    pie(slices,labels=roll_numbers,shadow=True,frame=True)
    savefig(f'outputs/Batch Statistics-{name}.pdf')
```

**department.py**

```
from csv import reader,writer
from collections import namedtuple
from matplotlib.pyplot import
 ↪  plot,xlabel,ylabel,style,title,close,savefig
Batch=namedtuple('Performance',('batch','average'))
def _parse_args(argdict):
    wrong_arg=Exception('Either provide department_id or
     ↪  department_name')
    if len(argdict)>1:raise wrong_arg
    (param,val),=argdict.items()
    if param=='department_id':rown=0
    elif param=='department_name':rown=1
    else:raise wrong_arg
    return rown,val
def create_department(**kwargs):
    with open('databases/department.csv','a') as db:
        writer(db).writerow([
            kwargs['department_id'],
            kwargs['department_name'],
            ':'.join(kwargs['batches'])
        ])
def batches(**kwargs):
    rown,val=_parse_args(kwargs)
    with open('databases/department.csv','r') as db:
        for row in reader(db):
            if row[rown]==val:
                return row[2].split(':')
    return -1
def batch_averages(**kwargs):
    with open('databases/batch.csv','r') as
     ↪  batch_csv,open('databases/course.csv','r') as course_csv:
        batch_db=reader(batch_csv)
        course_db=reader(course_csv)
        for batch in batches(**kwargs):
```

```
            total=0
            for row in batch_db:
                if row[0]==batch:
                    batch_csv.seek(0)
                    courses=row[3].split(':')
                    students=row[4].split(':')
                    batch_csv.seek(0)
                    break
            for course in courses:
                for row in course_db:
                    if row[0]==course:
                        performance=row[2]
                        for student in students:
                            i=performance.index(student)
                            a=performance.find(':',i)
                            b=performance.find('-',i)
                            total+=float(performance[a+1:b])
                        course_csv.seek(0)
                        break
            yield Batch(batch,total/(len(students)*len(courses)))
def department_statistics(**kwargs):
    close()
    def year(performance):
        a=float(performance.batch[-2:])
        if a>22:
            return 1900+a
        return 2000+a
    stat=list(batch_averages(**kwargs))
    stat.sort(key=year)
    style.use('Solarize_Light2')
    plot([p.average for p in stat],[p.batch for p in
     ↪  stat],linestyle='--')
    xlabel('Batch Average')
    ylabel('Batch')
    name=tuple(kwargs.values())[0]
    title(name)
    savefig(f'outputs/Department Statistics-{name}.pdf')
```

**examination.py**

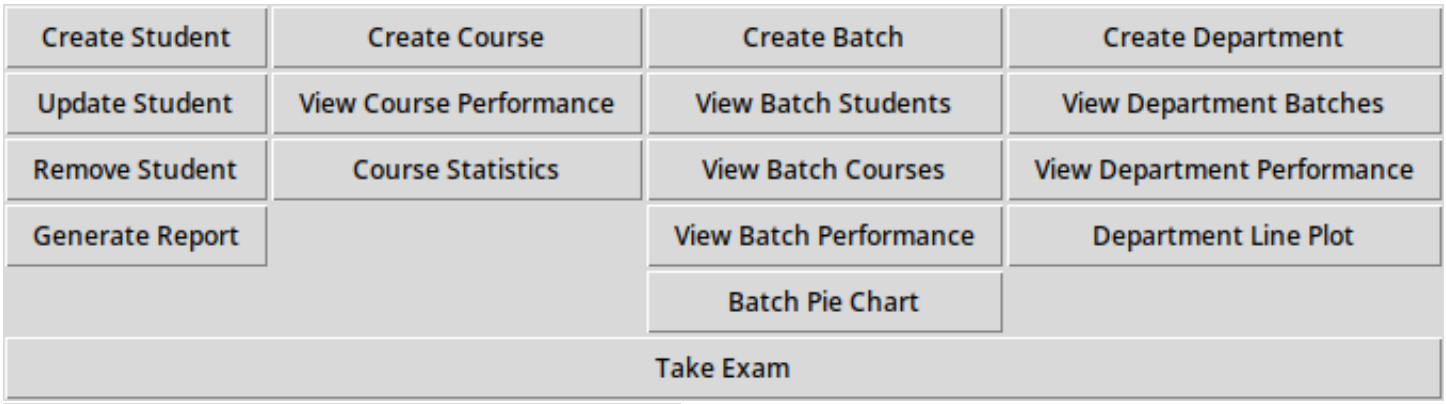
```
from csv import reader,writer
from numpy import nan,linspace
from collections import namedtuple
from matplotlib.pyplot import
 ↪  scatter,title,xlabel,ylabel,style,legend,close,savefig
from matplotlib.cm import Oranges as colormap #change to change
 ↪  colormap
Student=namedtuple('Performance',('student_id','average'))
Paper=namedtuple('Paper',('batch','student','roll_no','course','stude
 ↪  nts','courses'))
class Examination:
    def __init__(self,exam_name,*batches):
        self.name=exam_name
        self.batches=batches
        self.course_name={}
        self.exam_data={}
```

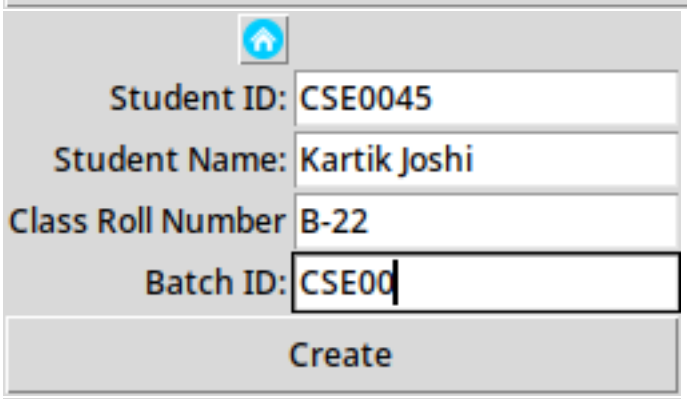
```
    #remember data
    with open('databases/course.csv','r') as csvfile:
        csvfile.readline()
        for course_id,name,performance in reader(csvfile):
            self.exam_data[course_id]={} if performance=='' else
                dict((i.split(':') for i in
                ↪  performance.split('-')))
            self.course_name[course_id]=name
    self.student_performance={}
def take_exam(self):
    with open('databases/batch.csv','r') as
     ↪  batchcsv,open('databases/student.csv') as studentcsv:
        student_info=reader(studentcsv)
        for row in reader(batchcsv):
            batch_id=row[0]
            if batch_id in self.batches:
                courses=row[3].split(':')
                lcourses=len(courses)
                students=row[4].split(':')
                lstudents=len(students)
                for student in students:
                    total=0
                    for info in student_info:
                        if info[0]==student:#found student id
                            studentcsv.seek(0)
                            break
                    for course in courses:
                        yield Paper(batch_id,student,info[2],cour
                         ↪  se,lstudents,lcourses)
def enter_marks(self,exam):
    #get data
    plot_data={}
    for paper,marks in exam:
        try:
            self.student_performance[paper.student]+=marks/paper.
             ↪  courses
        except KeyError:
            self.student_performance[paper.student]=marks/paper.c
             ↪  ourses
        self.exam_data[paper.course][paper.student]=marks
        try:
            plot_data[paper.course][paper.batch]+=marks/paper.stu
             ↪  dents
        except KeyError:
            try:
                plot_data[paper.course][paper.batch]=marks/paper.
                 ↪  students
            except KeyError:
                plot_data[paper.course]={paper.batch:marks/paper.
                 ↪  students}
    #save data
    with open('databases/course.csv','w') as csvfile:
        db=writer(csvfile)
        db.writerow(['Course ID','Course Name','Marks Obtained'])
        for course in self.course_name:
            db.writerow([
                course,
                self.course_name[course],
```

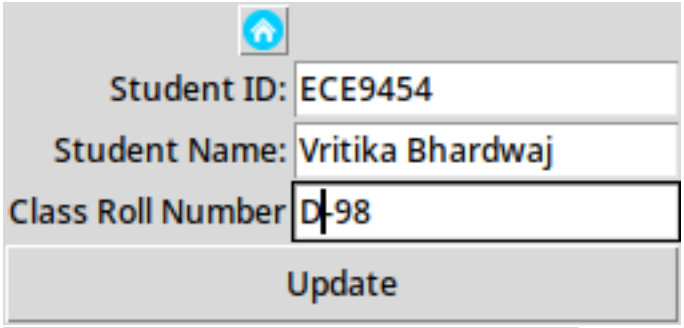
```
                '-'.join((f'{student}:{marks}' for student,marks
                ↪  in self.exam_data[course].items()))
            ])
        #arrange data
        self.data=[]
        self.courses=[]
        for course,course_data in plot_data.items():
            batch_data=[]
            for batch in self.batches:
                try:
                    batch_data.append(course_data[batch])
                except KeyError:
                    batch_data.append(nan)
            self.courses.append(course)
            self.data.append(batch_data)
        self.courses,self.data=tuple(zip(*((x,y) for x,y in
        ↪  sorted(zip(self.courses,self.data)))))#sort data
    def statistics(self):
        close()
        style.use('Solarize_Light2')
        xlabel('Average Marks')
        ylabel('Batch')
        title(self.name)
        legend(
            (scatter(marks,self.batches,color=color,edgecolor='black'
                ) for marks,color in
                zip(self.data,colormap(linspace(0,1,len(self.data))))
            ↭  ),
            self.courses
        )
        savefig(f'outputs/{self.name} Exam.pdf')
```

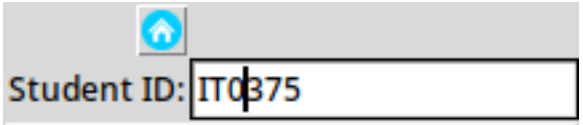
# 5 Outputs

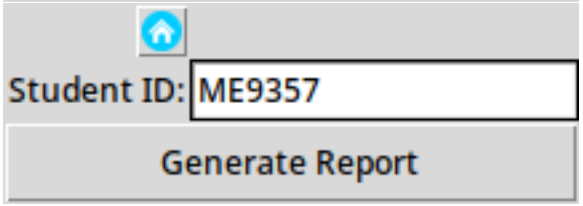
### Graphic User Interface

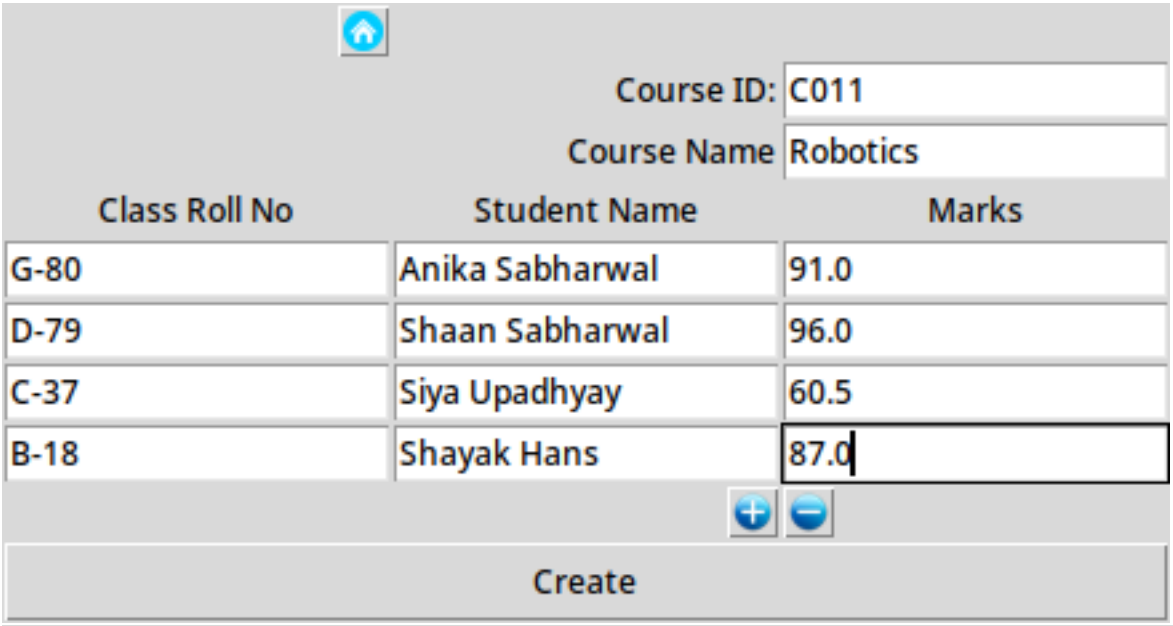


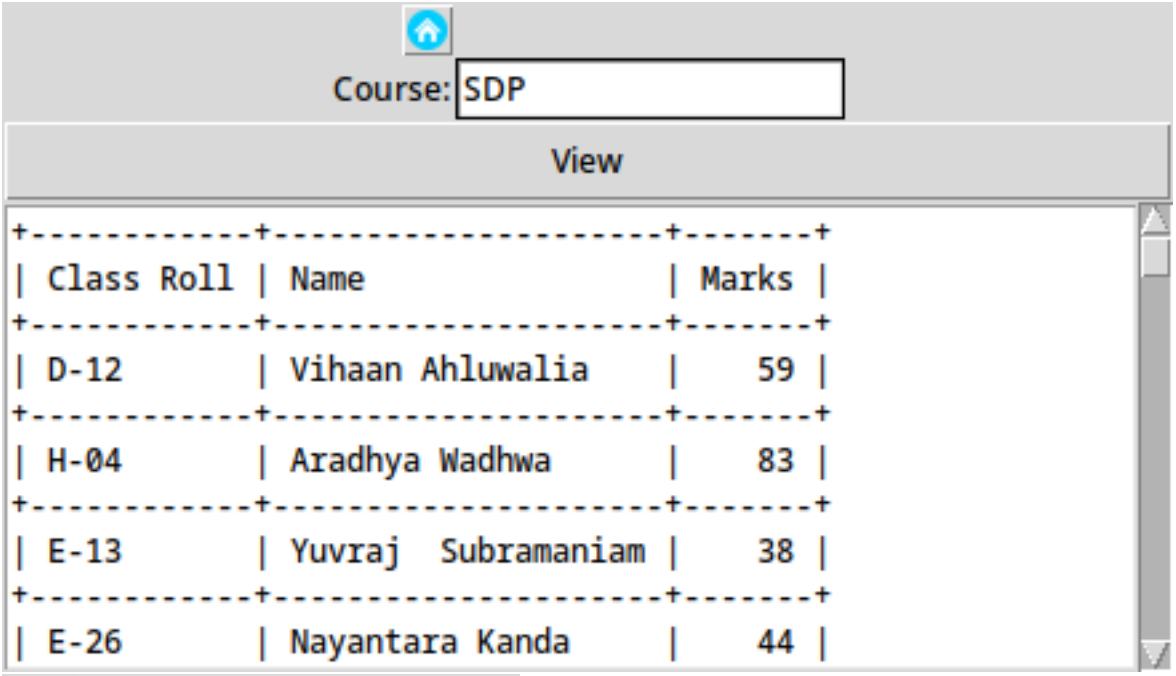



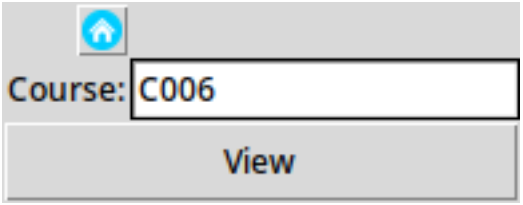



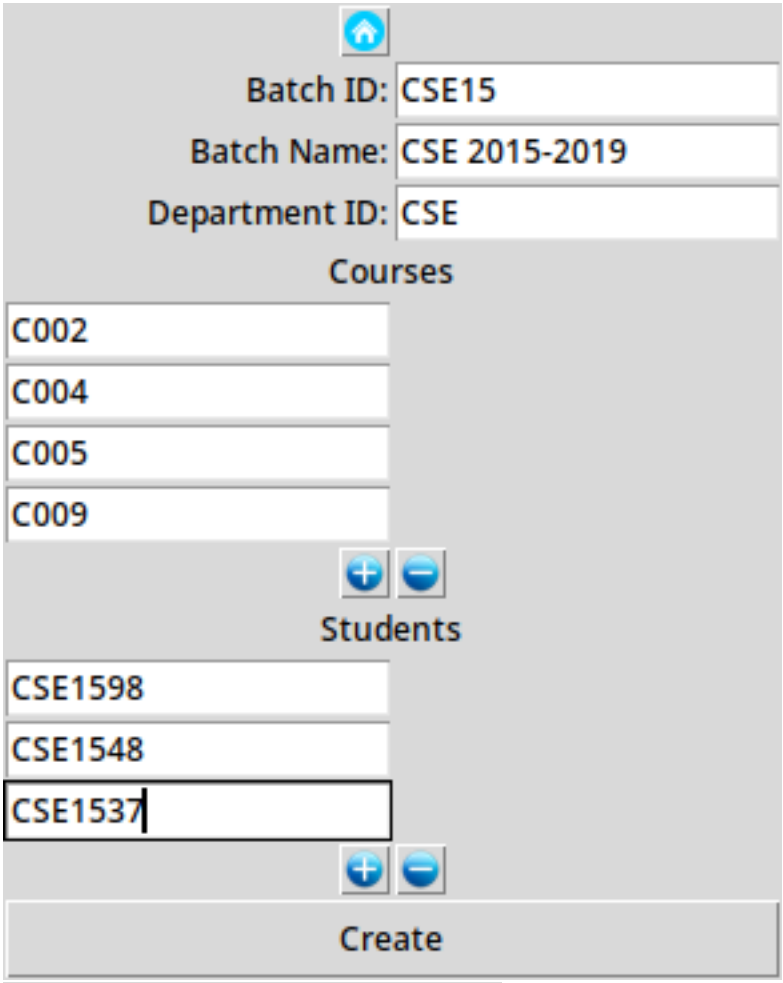



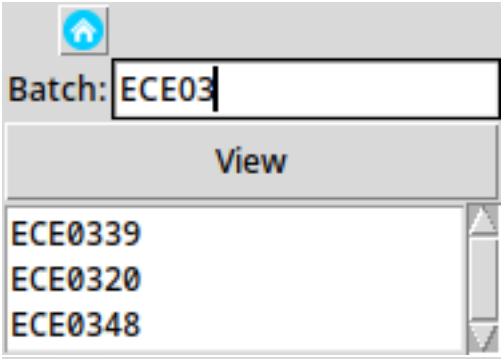



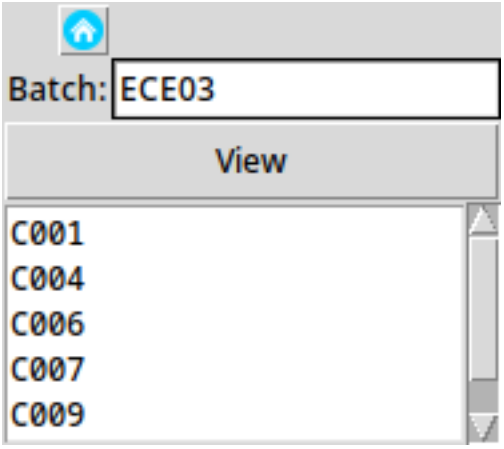

Course ID: C011
Course Name Robotics
Class Roll No
Student Name
Marks
G-80
Anika Sabharwal
91.0
D-79
Shaan Sabharwal
96.0
C-37
Siya Upadhyay
60.5
B-18
Shayak Hans
87.0
Create

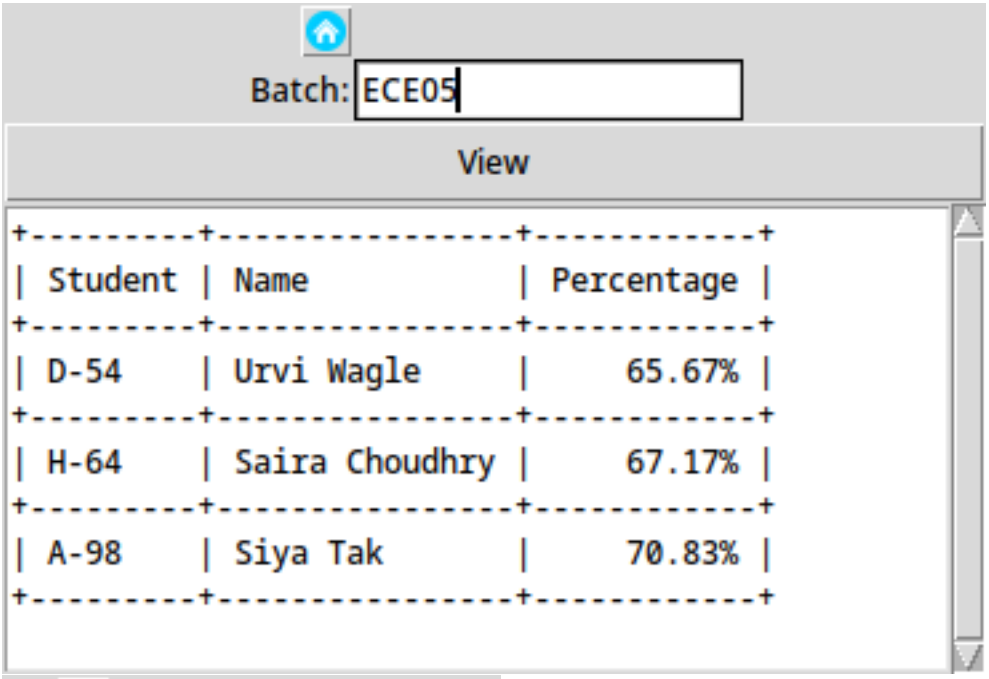

Course: SDP
View
+------------+----------------------+-------+
| Class Roll | Name | Marks |
+------------+----------------------+-------+
| D-12 | Vihaan Ahluwalia | 59 |
+------------+----------------------+-------+
| H-04 | Aradhya Wadhwa | 83 |
+------------+----------------------+-------+
| E-13 | Yuvraj Subramaniam | 38 |
+------------+----------------------+-------+
| E-26 | Nayantara Kanda | 44 |

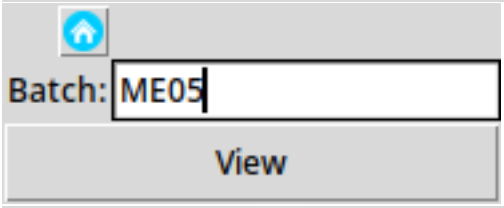

Course: C006
View

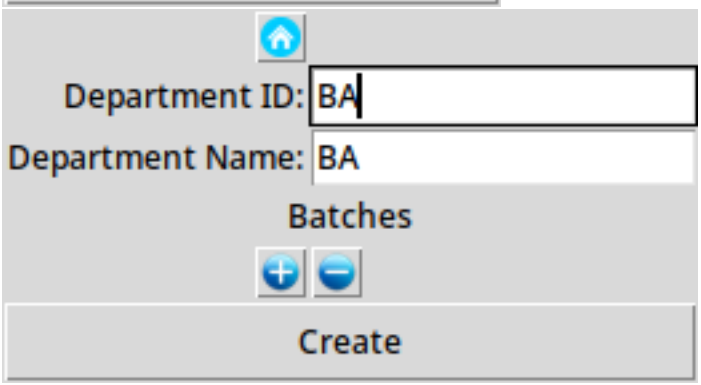

Batch ID: CSE15
Batch Name: CSE 2015-2019
Department ID: CSE
Courses
C002
C004
C005
C009
Students
CSE1598
CSE1548
CSE1537
Create

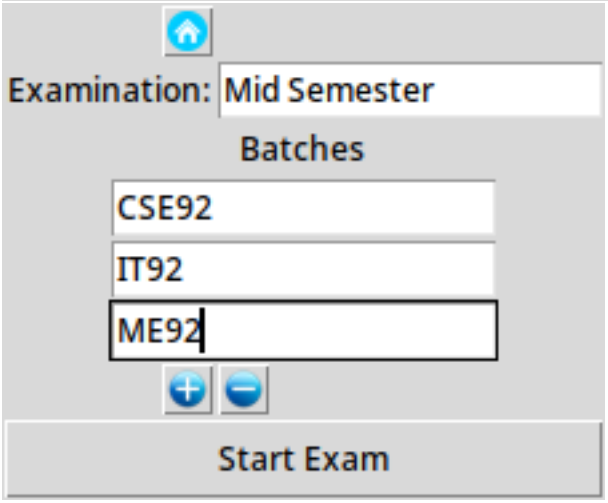

Batch: ECE03
View
ECE0339
ECE0320
ECE0348

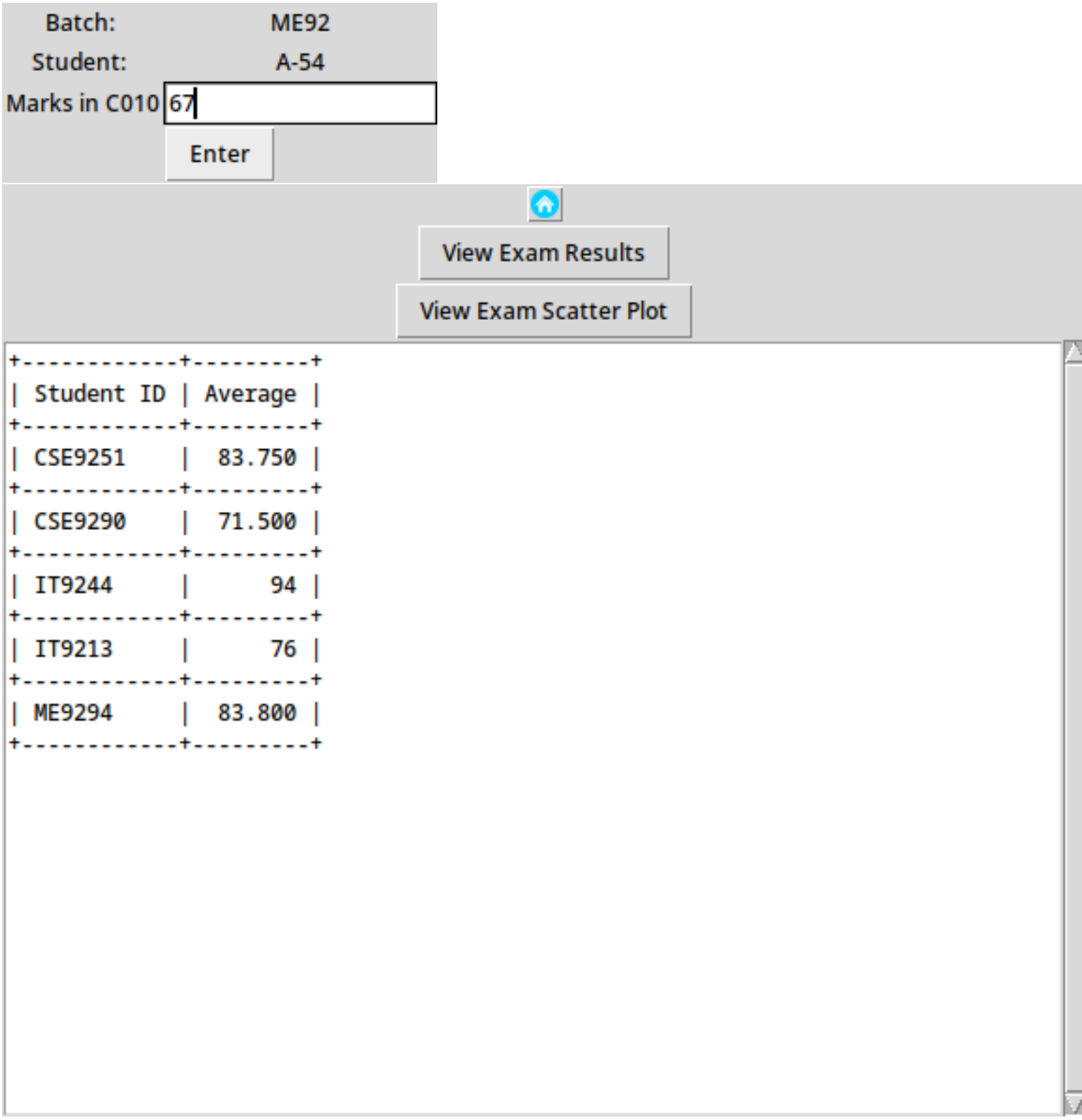

Batch: ECE03
View
C001
C004
C006
C007
C009


Batch: ECE05
View
+---------+----------------+------------+
| Student | Name           | Percentage |
+---------+----------------+------------+
| D-54    | Urvi Wagle     |     65.67% |
+---------+----------------+------------+
| H-64    | Saira Choudhry |     67.17% |
+---------+----------------+------------+
| A-98    | Siya Tak       |     70.83% |
+---------+----------------+------------+


Batch: ME05
View


Department ID: BA
Department Name: BA
Batches
Create


Examination: Mid Semester
Batches
CSE92
IT92
ME92
Start Exam




**ME9357-report_card.txt**

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**Anvi Warrior (A-80)**

| Course | Course Id | Marks Obtained | Full Marks | Grade | Remarks |
|---|---|---|---|---|---|
| Biology | C003 | 32 | 100 | F | Failed |
| Electrical | C004 | 79 | 100 | C | Passed |
| Python | C006 | 60 | 100 | D | Passed |
| ESP | C009 | 62 | 100 | D | Passed |
| SDP | C010 | 45 | 100 | F | Failed |
| Total | - | 278 | 500 | E | Passed |

**ID:ME9357**
**Batch:ME93**

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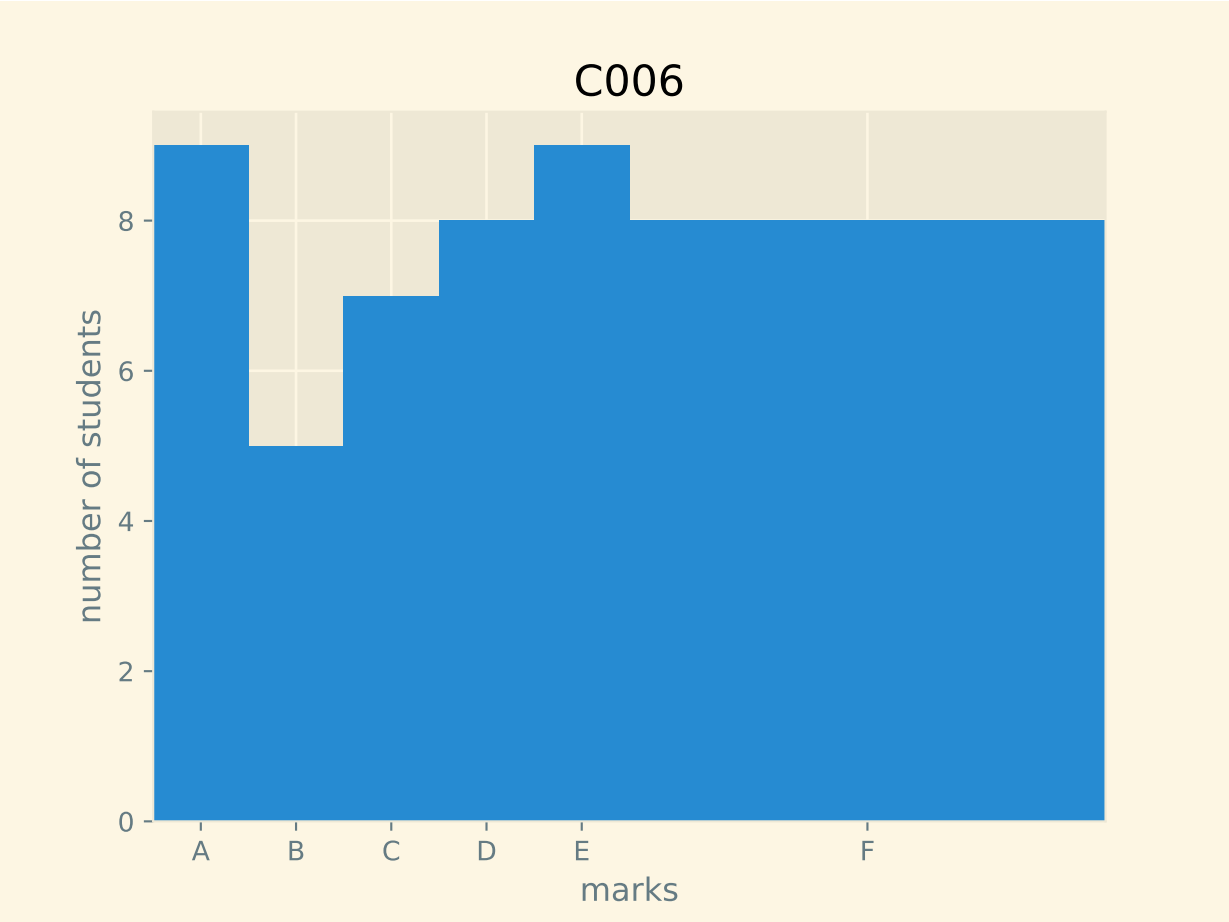
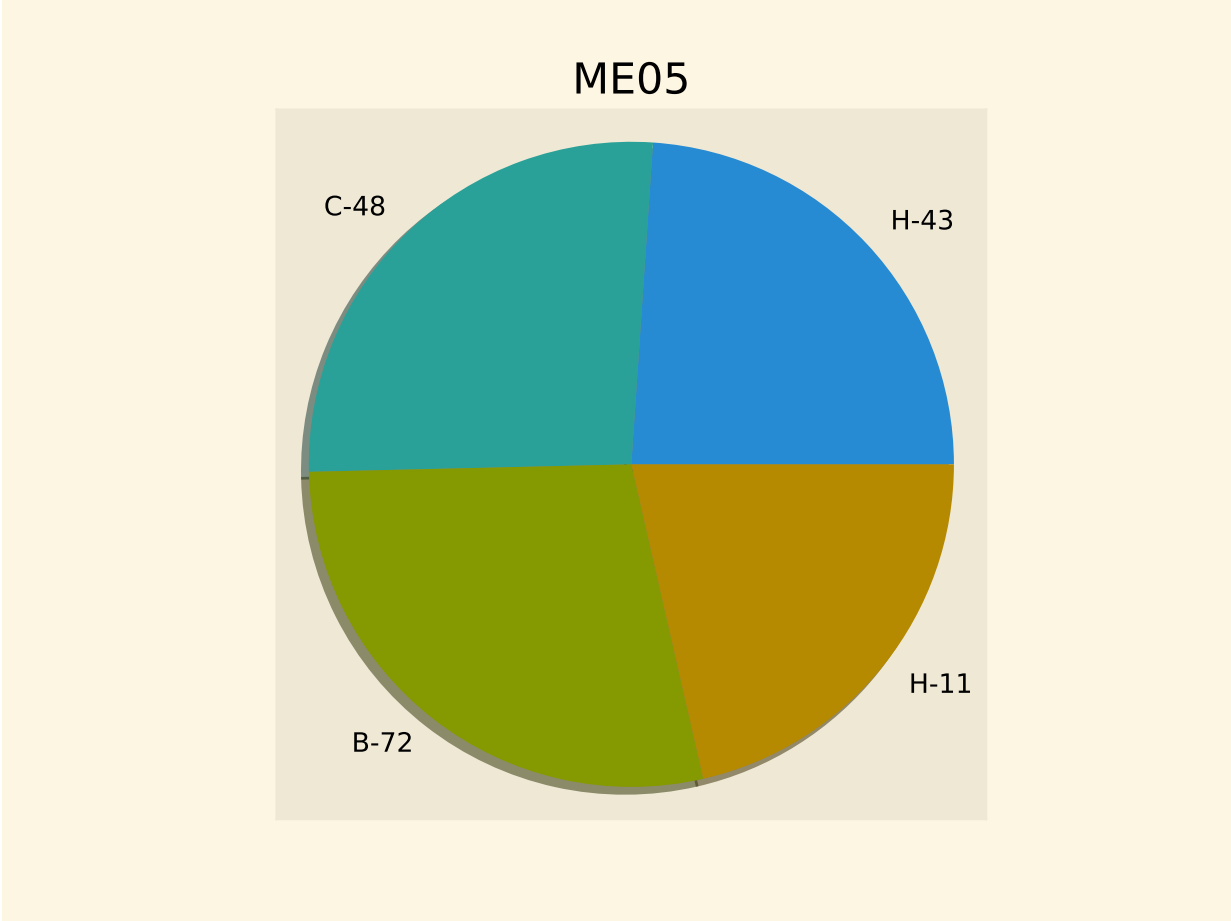
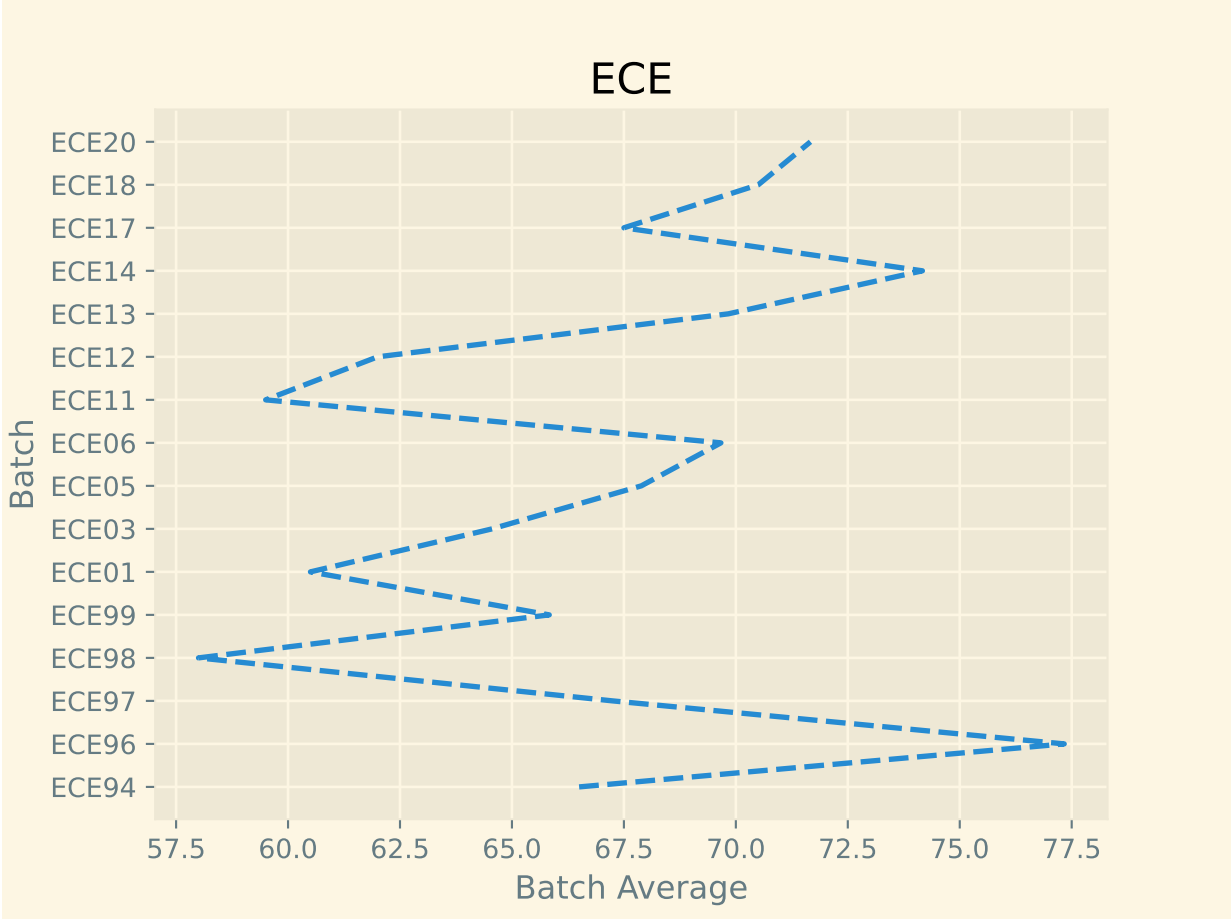
## Course Statistics-C006.pdf

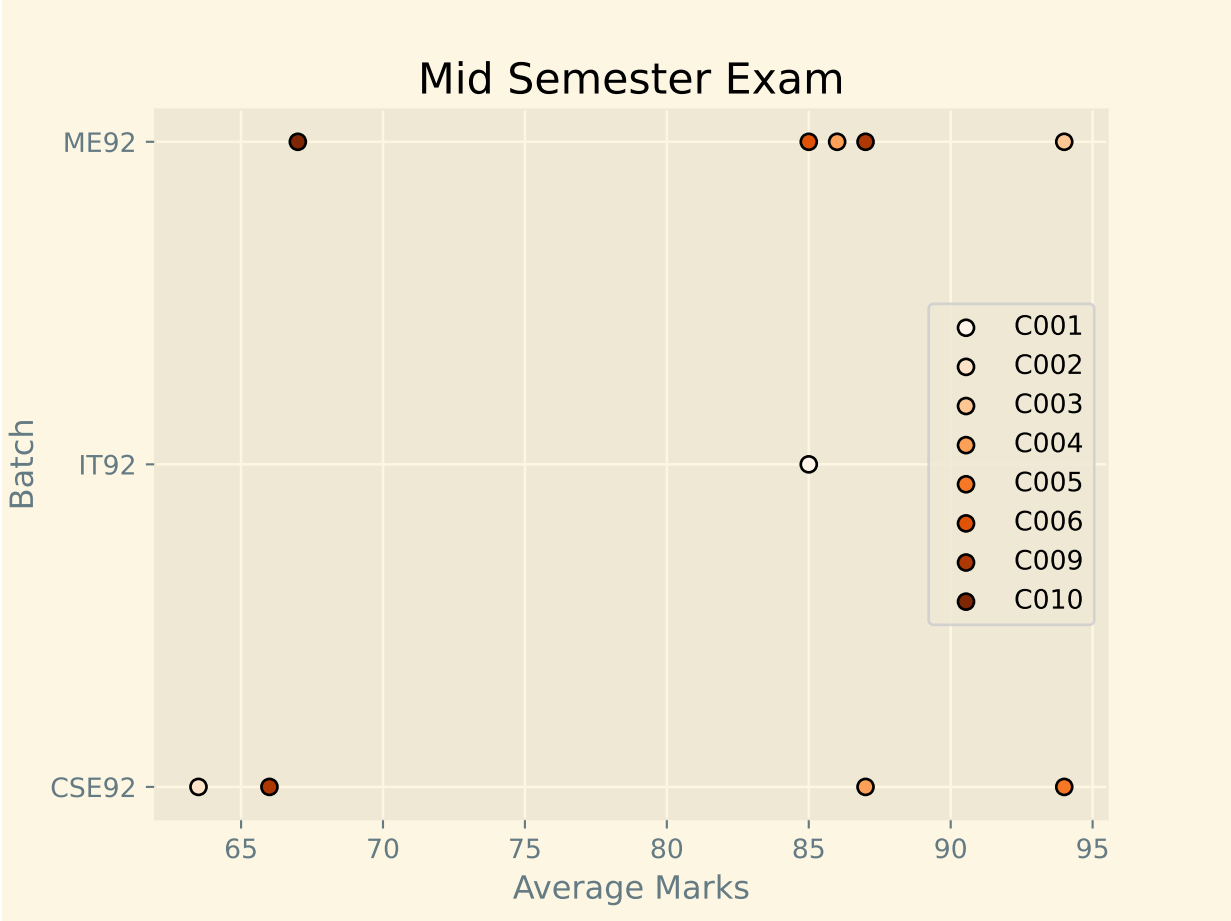


# Batch Statistics-ME05.pdf



**Department Statistics-ECE.pdf**




Mid Semester Exam
ME92
IT92
CSE92
Batch
65
70
75
80
85
90
95
Average Marks
C001
C002
C003
C004
C005
C006
C009
C010