**Chapter 1**

**WORK FLOW MANAGEMENT**

1. **INTRODUCTION**

In object-oriented programming, a **virtual class** is a nested inner class whose functions and member variables can be overridden and redefined by subclasses of an outer classVirtual classes are analogous to virtual functions.

The run time type of a virtual class depends on the run time type of an object of the outer class. (Just like the run time type of an object decides which virtual function should be used.)

Virtual classes solve the extensibility problem of extending data abstraction with new functions and representations. Like virtual functions, virtual classes follow the same rules of definition, overriding, and reference.

When a derived class inherits from a base class, it must define or override the virtual inner classes it inherited from the base class. An object of the child class may be referred to by a reference or pointer of the parent class type or the child class type. When the reference or pointer invoke the virtual inner classes, the derived class's implementation will be called if the object is of the derived class type. The type of the outer class determines the run time of the inner virtual class...

A method with an object argument has access to the object's virtual classes. The method can use the virtual classes of its arguments to create instances and declare variables. Virtual classes of different instances are not compatible

#### Introduction to problem domain

Asweknowthat,acollegeconsistsofdifferentdepartments,suchascoursedepartments,feesmanage- ment,library,eventmanagementetc.Nowadaysapplicationsandusesofinformationtechnologiesis increasedascomparedtobefore,eachoftheseindividualdepartmentshasitsowncomputersystemto dotheirownfunctionalities.Byhavingonemainsystemtheycaninteractwitheachotherfromtheir respectedsystembyhavingvaliduseridandpassword.

#### Aim of the problem

TheobjectiveofCollegeInformationManagementSystemistoallowthead-ministratorofanyorgani- zationtheabilitytoeditandfindoutthepersonaldetailsofastudentandallowsthestudenttokeep uptodatehisprofile.It’llalsofacilitatekeepingalltherecordsofstudents,suchastheirid,name, mailingaddress,phonenumber,DOBetc.Soalltheinformationaboutastudentwillbeavailableina fewseconds.Overall,it’llmakeStudentInformationaneasierjobfortheadministratorandthestudentofany organization.

ThemainpurposeofthisprojectistoillustratetherequirementsoftheprojectCollegeInformation ManagementSystemandisintendedtohelpanyorganizationtomaintainandmanagepersonaldata. Itisacomprehensiveprojectdevelopedfromthegrounduptofulfilltheneedsofcollegesastheyguide theirstudents.Thisintegratedinformationmanagementsystemconnectsdailyoperationsinthecol- legeenvironmentrangingfromAttendancemanagementtocommunicationalmeansamongstudentsand teachers.Thisreducesdataerrorandensuresthatinformationisalwaysup-to-datethroughoutthecol- lege.Itprovidesasinglesourceofdatarepositoryforstreamliningyourprocessesandforallreporting purposes.Ithasasimpleuserinterfaceandisintuitive.Thisinsuresthattheusersspendlesstime inlearningthesystemandhence,increasetheirproductivity.Efficientsecurityfeaturesprovidedata privacy and hence, increase theirproductivity.

#### Time schedule for completion of the project work

The Project schedule activities will consist of following:

* + - 1. Forming The Team
      2. Selecting The Project Title
      3. System Requirement Collection
      4. System Design
      5. Acquiring the required resources
      6. Coding
      7. Testing of the application
      8. Deployment

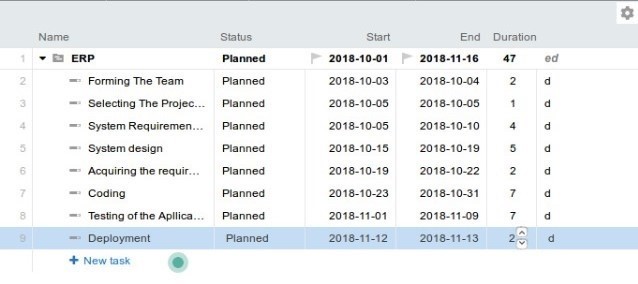


Figure 1.1: Time Schedule

##### Gantt Chart

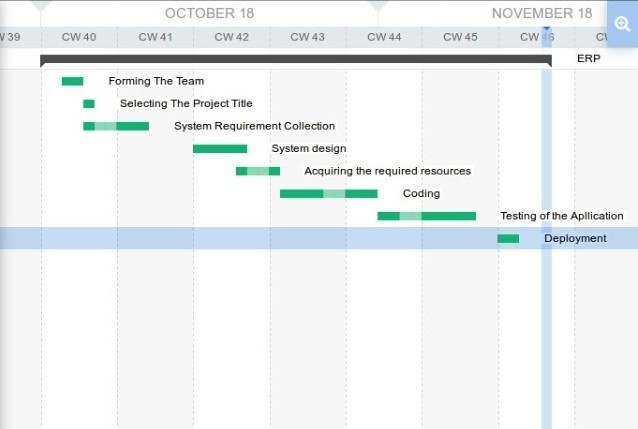


Figure 1.2: Gantt Chart

## Chapter 2

**System Requirement Engineering**

### Inception

Inceptionisaprocessofestablishingabasicunderstandingoftheproblemandthenatureofthesolution. Thisincludestheneedforthissoftware,identificationofstakeholdersanddefiningmultipleviewpoints.

#### What is the purpose of this project?

ThereiscurrentlyanERPsysteminourcollege.But,noteveryoneishappywiththesystem.Whileit isasteptowardsautomatingthecollegeactivities,itcomeswithitsownsetofproblems.Thisprojectis designedtoimplementacollegeERPsystemtoeradicatesomeoftheseproblemsandaddsomefeatures of our own that would add value tosystem.

#### Why do we need ERP?

Nowadays,inschoolsandcolleges,itisverydifficulttomanageeachandeverythingmanually.Super- visingandmaintainingthewholedatabaseofaschoolorcollegecanbetime-consumingandchallenging especiallyifit’sdoneonaregularbasis.So,weneedtohandleandmanageeverythingsmartly.

TosolvethisproblemERP(EnterpriseResourcePlanning)isused.ERPsoftwaremakesiteasyto tracktheprogressofeverydepartmentofschoolandautomatedifferentfunctions.WithERPevery- thingcanbeseenonasingledashboard.Theadministratorcanmanagethecollegefromanywhere.The possibilitiesofmaintainingthewholedatabaseofacollegewithERPsoftwareareendless.

Some of the prominent roles of ERP are:

* + - * Manages the office and automates differentfunctions.
      * Helpsinlong-termmanagementandplanningofalldepartmentsofcollege.
      * Eliminatestheneedforhavingmultiplemanagementsoftwareforeachdepartment.
      * Dailyactivitieslikeattendancecanbedigitalizedandautomated.
      * Leave module for teachers can beautomated.

**2.1.3 . PROJECT DISCRIPION**

A virtual classroom is a teaching and learning environment where participants can interact, communicate, view and discuss presentations, and engage with learning resources while working in groups, all in an online setting. The medium is often through a video conferencing application that allows multiple users to be connected at the same time through the Internet, which allows users from virtually anywhere to participate.

#### 2.1.4Identification of stake holders

EnterpriseResourceplanningimplementationisadifficultandcomplexdecisionwhereitinvolvespeople issuesmorethantechnologicalissues.Identificationofstakeholdersisakeystepduringtheprocessof ERPimplementation,becauseifdoneimproperly,itwillleadtofailureoftheimplementationproject. The stakeholders are listedbelow:

##### Teachers

TeachersarethekeystakeholdersofthecollegeERP.Becausetheyaretheonewhomanage,edit,update thecontentsofthedatabaseofstudentssuchasattendance,internalmarks,CGPAetc...

Italsohelpsthemtoassigntheirclasstootherteacherswhentheyareonleave.Thismakesiteasier toidentifywhoamongthemarefreetotaketheclassatthattime.Sothissoftwarehelpthemreduce theiroverheadandmaketheirtaskseasierandsimple.

##### Students

StudentsareendusersofERPsoftware.Theattendance,internalsmarksuploadedbytheteachersare viewedbystudents.Ithelpsthemtracktheirattendancestatus.Italsohelpsthemtocommunicate withteachersandtheirclassmates.Sostudentsmakeupanothersetofstakeholdersofthissoftware.

##### Administrator

Collegeadministratorisresponsibleformaintainingthedatabaseofthecollege.Theywillhavethe privilegetomodifythedatabasei.e.,toadd/removestudents/teachers/staff,updateinformationregard- ingeachofthese.Itistheirresponsibilitytomaintainthedatabaseofstudentswhopassoutfromthe collegeandwhofreshlygetadmissiontothecollege.SotheAdministratorplayamajorroleintheERP.

#### Viewpoints

##### Teachers viewpoint

Forateacher,thissoftwaremustbeeasytouse.Itshouldbeeasytofinddifferentmoduleslikeatten- dance,leavemodule,internalsmarks,resultetc...Teachersaretheonewhoupdatethecontentsofthe database, so it should be update save modifyIt.

##### Students viewpoint

Astudentcanonlyviewtheinformationabouthimself,otherthanthateverythingwillbehiddenfrom them.Theywillnothavetheoptiontoeditanything.Sothegraphicaluserinterfacemustbegood. They expect it to befunctional.

##### Administrator’s viewpoint

Administratorwillhavetheprivilegetoviewalltheinformationaboutthecollege. Theywillhavethe optiontotrackgoalslike,Averagemarksofallthestudentsinasubject,Averageattendanceofallthe students of a classetc...

### Elicitation

Whenwestartedtheproject,wedecidedtocollecttheinformationfromacoupleofstakeholderslike teachers,administrators,studentsandparents.TheystatedtheirroleintheERPsystem,theirproblems, likesanddislikes,problemstheyarefacingwiththesoftwareandhowitisimplemented

#### Teachers

WehadanopportunitytomeetourcollegeComputerScienceDepartmentProf.Dr.TrisilaDeviNagavi andProf.DivakarN.TheygaveusanideaabouthowourcollegeERPwasworkingandexplained abouttheirroleintheERP.Weaskedthefollowingquestions

##### Can you explain the attendance entry process in detail?

Generally,justlikethestudents,eventeachershavetheirownuserIDandpasswordforthelogin purpose.Therewillbeacolumnreservedforattendancepurposeinahierarchicalmanner.Firstthere willbetwocolumnsclassandsubjects.Undertheclasscolumntherewillbealistofalltheclasses allottedtothefaculty.Ontheothercolumnthereissubjectswhichisfurtherdividedintotheoretical subjectswhichareof4creditsandintegratedsubjectswhichareof5creditsfortheuniversitybatch students.Sincethereareautonomousbatchstudentswhoareyettocompletetheirdegreethereare separatecolumnsreservedforthemsincetheirpatternisdifferentfromtheuniversitysyllabus.Theywill behavingtheoreticalsubjectsof4creditseachandtheywillalsobehavingseparatelabsessionsof1.5 creditseach.Sincethecreditsofautonomoussubjectsvaryfromthoseofthesubjectsoftheuniversity subjectstheremustbechangesintermsofattendanceandthecreditsallocatedforeachsubject.

##### Can you explain how application for leave is managed in the ERP system?

Thentherewillbeacolumnforthetypeofclass.Inthistherewillbefurthertwotypes.Regular classesandalternateclasses.Regularclassesarethosewhichthefacultyhandlesfortheallocatedclass asspecifiedinthetime-table.Alternateclassesarethosewhichthefacultyhandlesintheabsenceof anotherfaculty.Whenthefacultyisonleave,itmustbeinformedintheERPsuchthatthemessage goestotheprofessorsandatthesametimeanotherteacherwhoisfree.Ifthefacultywantstotake extraclassesduetotheincompletionofthecourses,thentheyshouldinformthestudentsintheforum about the extra class and they can handleit

Generally, for the teachers there are basically 4 types of leave.

1. Earned leave
2. Restricted leave.
3. Casual leave.
4. Sickleave.

##### What are some problem that you face with the current ERP system?

TheproblemwiththeERPsoftwareisifthefacultyappliesforleaveandwantstoallocatetheclass toanyotherfaculty,thentherequestgoestoallthefacultiesofallthedepartments. Thisshouldnot happenbecauseotherdepartmentfacultycannothandletheclassforanyotherdepartmenti.e.ifthe facultyofComputerSciencedepartmentappliesfortheleaveandiftherequestissent,itmustbesent tothefacultiesoftheComputerSciencedepartmentonlyandnotforanyotherdepartmentlikeCivil

,Mechanical, E&E, and so on.

Whenthefacultyisinsertingtheattendanceintothesystem,theremustbeaseparatespacefor thefacultytofillwhattopicstheyhavecoveredintheclass.Itwillbetimeconsumingforthefaculty toenterthetopiceverytime.So,forthispurposethesoftwaremustbedesignedinsuchawaythat itinsertsthetopicautomatically.Firstly,allthetopicsandthedurationforthefacultyinwhichthe facultymustcovermustbementioned.Andthenthefacultymustinvestigateitandcoverthesyllabus accordingtotheplan.Thiscanalsokeepatrackofthelecturerwhattheyareteaching.Ifthedoubts areraisedbythestudents,thenthatwouldleadtoshortageoftimetocoverthesyllabus.So,forthis purposethefacultycanhavethefreedomtoextendthedurationtocoverthosetopicsbyhandlingextra

classeswhenthestudentsarefree.Fortakingtheextraclass,thefacultymustblockinthetimetable anditmustbevisibletoallthefacultiesofthatclasssothattherewouldbenocollisioninhandling theextraclass.Onceifthefacultyenterstheattendanceandiftheypresslockoption,thentherewon’t beanyoptiontochangetheattendanceofthestudents.Lastly,theteacherswouldlikeitiftheycould entertheattendanceintheclassitself.Thiswouldminimizethepaperworkandtheycouldupdatethe details at any place and at anytime.

##### What do you expect from the module the lets you enter the marks of the students?

TherewillbeanothersectiontoentertheCIEofallthestudents.Theinternalswillbefor20marks andwhenthefacultyentersitintotheERP,itmustautomaticallyconvertitinto10marks.Generally, therewillbe5events.Therewillbe3internals,followedbytwoeventssuchasquiz,project.Ifthe studentscoresbelow50%oftheallocatedmarksinthesubject,thentheremustbeawarningmessage senttothestudenttoscoremoremarksintheupcominginternals.

Attheendofalltheeventsifthestudentcouldnotmarkthe50mark,thentherewillbeamake-up testconductedbythefacultysothatthestudentwouldbehavinganotherchancetocomeuptothe markof50%.Thismake-uptestmarksmustbealteredwiththeminimummarksoftheCIEscored. AndthefinalCIEmarksshouldbedisplayedandbestatedthatthestudentiseligibleornoteligibleto takeuptheSemesterEndExamination.IfthestudentisnotabletotakeuptheCIEduetopersonal reasonsorifheisrepresentingthecollegeinanyformoftheactivity,thenitmustbebroughtintothe noticeofthelecturerandtheleavecanbeavailed.Ifthestudentisill,thenthemedicalcertificatemust beattested,andalettermustbesenttotheHODtotakeupre-test.AfterthefacultyenterstheCIE theremustbeanoptiontosavetheCIEmarks.WhentheCIEmarksaresavedthenthestudentswill notbeabletoseethemarksintheirmarks.TheycanviewtheirCIEonlywhenthemarksarelocked bythefaculty.IfthefacultylockstheCIE,thentherewouldnotbeanychancetochangetheCIE.The CIEmustbelockedafterconfirmingthemarkswiththestudentsonly.

#### Student

Wemetseveralofourclassmatesandaskedthemsomequestionsonbehalfofthestudentsinthecollege.

Figure 2: Requirements gathering from sineors.

##### As a student, what are some problems you are facing with the current ERP system?

TheERPstatuswasnotupdatedregularly,andtheycouldnottracktheirattendancestatusasthe appwouldcrash.TheGUIthatisusedintheinterfaceisnotuptothemark.Itisdifficulttokeepthe trackoftheattendanceandtheCIE.Itwouldbeeasyiftheattendancewouldbeshowninacalendar likeformatsothatitwouldbeconvenientandcanalsokeepatrackofthestatusoftheattendance. Thereshouldalsobeforumswheretheteacherandthestudentsareactive.Thiswillhelpthestudents inmanywayssuchasstudies,assignments,projectsandsoon.Thereshouldbeinteractionwiththe student-studentandstudent-teachersothatthestudentscancleartheirdoubtswithanyteacheraswell asanystudentatanypointoftime.Theforumwillalsohelpthestudentsinconveyingtheinformation to all the students at a fasterrate.

Forthestudentswhowereinsupplementarybatch,theycouldnotattendthefirstfewweeksofclassas theyhadexams.But,intheERPtheyweremarkedasabsentwhichmadetheirattendancedrastically low.

WhenthestudentsareintocollegeactivitiessuchasLCCsessions,IEEEsessions,representingour collegeinsportsoranyotheractivitiesthenstudentsaremarkedabsent.Theremustbeanotherway tohandletheseproblemssothattherewillbejusticeforthestudentsfortheirhardwork.

#### Administrator

We met the college administrator and asked the following question

##### What are your requirements from the ERP system as an admin?

Asanadministrator,theydealwithlargeamountofdataandfunctions.Thesystemmustbemodular withasimpleinterface.Theadminperformsmanyfunctionsonthedatabase.Theseincludesearching forarecord,add,updateanddeletearecord.Thus,theirinterfaceneedstobequickandsearchingfor records in the huge database must beoptimized.

### Elaboration

For the College ERP project, there are many classes of end users. These include the college staff, studentsandadmin.Asmentionedintheelicitationsection,wetalkedwithseveralstakeholdersof differentclassesandcollectedtheirrequirements.Therequirementsofthedifferentclasseswerediverse. Someofthemwereinunisonandsomewereinconflict.Thus,elaborationandlaternegotiationis required.

#### College staff

CollegestaffarekeystakeholdersandusetheERPsystemthemost.Thus,itisessentialtocaterto theirneedsfirst.Amongthestaffthereareseveraldifferentroles.Foreachrole,TheERPsystemwill haveadifferentviewbasedontherequirementsofthatgroup.Amongthestafftherequirementsofthe various groups are describedbelow.

##### Teaching staff

Teachingstaffmakeupmostofthestaff.AteacherexpectstheERPsystemtobeeasytouse,reliable andreducetheworkload.Eachteacherbelongstodepartmentandareassignedtoaclassofstudents withacourse.So,theteachershouldonlybeabletoviewandmanipulatethedataofthestudentsthat they are assignedto.

Theteachers’involvementIntheERPSystem,istoentertheattendance,theinternalmarks,the semesterendexaminationmarks.Theywillalsohaveotherfeatureswhichincludeavailingleaveand managing a lecture plan for eachcourse.

ForAttendancemanagement,theteachersexpectacompactandfunctionalinterface.Aninterface whereteachersuseminimalefforttomanagetheattendancestatusofthestudents.Thefeaturesexpected fortheattendancearetoabilitytoentertheattendancetotheentireclassatonce,edittheattendance ofeachindividualstudent.Also,intheeventofleave,theyshouldbegivenanoptionofassigningthe classtoanotherteacher,whotakesacourseforthesameclass.

Intheeventofenteringinternalmarksandsemesterendexaminationmarks,theteacherenters themarksforeachindividualstudent.Thisisinitialadraftandcanbeedited.Thestudentsreview themarksandverify.Ifthereareanymistakes,thestudentnotifiestheteacherandthemistakesare corrected.Aftercertainamountoftime,whenallthemarksareconfirmed,themarksare‘locked’.i.e., After locking, the marks cannot tochanged.

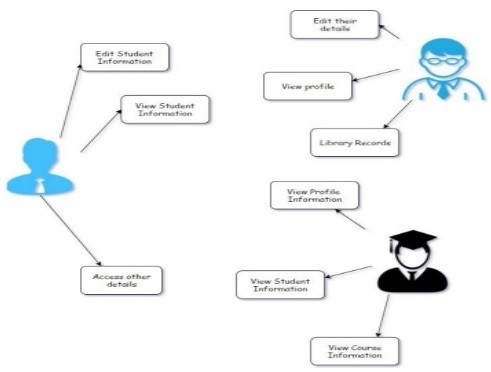
Whenateacherappliesforaleave,therearemanyoptionsfordifferentcategoriesofleave.Thefirst categoryiscasualleave,thisisforgeneralpurposes.Restrictedleavecanbeavailedonlyonspecificdays givenbythecollege.Then,Sickleaveisforwhentheteacherisill.Lastly,earnedleaveisanoption given to each teacher for a period of 15days.

##### Head of Department (HOD)

Theheadofdepartmentisapartoftheteachingstaffbuthasspecialprivileges.Theymanagethe operationsofeachdepartment.TheHODcouldstillconductcoursesforstudents.So,theywillhaveall thefeaturesgiventoateacher.Also,astheHOD,theywillhaveaccesstotherecordsofeveryteacher, courses,studentswhobelongtothesamedepartment.

##### Technical staff

Thetechnicalstaffprovidetechnicalsupporttotheteachingstaff.Thisincludestechnicalsupportin laboratoriessuchasmaintainingthefunctioningofcomputersinlabs,maintainingtheequipmentin theirrespectivedepartments.Unliketheteachingstaff,theydonotconductclasses.Theirroleinthe ERPsystemistoprovidesupporttootherstaffthroughcommunication.Also,theyhavethefeatureto avail for leave just like theteachers.



#### Students

Studentsareanotherclassofenduser.IntheERPsystem,studentscanviewinformationregarding theirattendancestatus,internalsmarks,Semesterendexaminationmarks,notificationsfromthecollege administrationetc.AstudentexpectstheERPsystemtobeaestheticandfunctional.Astudentshould only be able to view information abouthimself.

Studentsgenerallywanttonicegraphicalinterfacethatprovidesalotofinformation.Inthecaseof attendance,theywouldliketoseeadditionalinformationotherthanjustthenumberofclassesattended. Theywouldliketoseeday-wiseattendancesothattheycankeepbetterrecordoftheirdailyclasses. Studentsalsorequestedforadetailedviewofattendanceofeachsubjectinacalendarform.

Lastly,anotherfeaturethatstudentswouldliketoseeistheadditionofcommunicationandfeedback capabilities in the ERP. Students find it tough to communicate with other students withcommon interestsasthereisnocommoncommunicationmediuminthecollege.Aforumtypeinfrastructureis required in thesystem.

#### Administrator

AnadminholdsalltheprivilegesoftheERPsystem.Theadminhasaccesstoallthedatabasesinthe system.Theseincludestudentdatabase,teacherdatabase,coursesdatabaseandseveralothers.Their jobistomaintainthesystemsandaddressingtheproblemsfacedbytheotherusers.

Theadminneedsadequateresourcesandtherighttools.Theadminexpectsasimpleinterfacewhere they can easily access the required information.

### Negotiation

CollegeERPsystemisvastwithalotofdesiredfeaturesandfunctionality.Eachstakeholdergivestheir listofrequirements.Asaprojectwithfourgroupmembers,wedonothavetheresourcesandtoolsto implementalltherequirements.Thus,itisessentialtofindabalanceamongthevariousstakeholders wheretheycanbesatisfiedwiththeoutcomeoftheproject.Thisisachievedthroughnegotiationamong the various classes ofstakeholders.

ItisinourinteresttodevelopaWebappthatisfunctional,reliable,consistentandeasytouse.We collectedtherequirementsfromthedifferentstakeholdersthatinclude,theteachingstaff,technicalstaff, studentsandtheadministration.Wereviewedthelistofrequirementsandmadealistoffeasibleand non-feasiblerequirements.Wemeetthestakeholdersagainandexplainwhysomerequirementswerenot feasible.Forexample,theleavemodulefortheteacherscannottoimplementedasthatfeaturehasa lotfunctionalitythatisbeyondthescopeofthisproject.

Wealsofoundthatsomerequirementsfromdifferentstakeholderswereconflicting.Forexample,the studentshadrequestedforaoptiontoappealwrongmarkingofattendanceormarksbytheteacher. But,theteacherswereagainstthisfeatureasthatwouldincreasetheburdenontheteachersandthere wasalsoapossibilityoffalseusageofthisfeaturebythestudents.Consideringbothperspectives,we decidedtoagreewiththeteachersasthisfeaturewoulddispleaseteachers.Thestudentsweregiventhe reasonfornotincludingtheirrequirementandanagreementwasreached.

ThestudentswantedasocialmediatypefeatureimplementedontheERPwherethestudentsfrom thecollegecancommunicatewitheachotherandhaveafeedoftheeventsinthecollege.Whilethe featurewouldhavebeennicetosee,itwasbeyondthescopeofthisproject.Westatedthatsucha advancedversionoftherequirementswasnotpossible.But,aimplementationofthefeatureonasmaller scopewithlesserfunctionalitywaspossible. Therefore,wenegotiatedthefeaturesuntilbothparties were satisfied.

### Specification

#### Introduction

##### Purpose

ThepurposeofthisprojectistodevelopaCollegeManagementSystemthathelpstheteachersand studentsineasiermanagementofCollegeactivitiessuchasattendance,marks.

##### Intended Audience and Reading Suggestions

ThisprojectisintendedforstaffandstudentsofJSSScienceandTechnologyUniversity.Thisdocument hasbeenmadeundertheguidanceofcollegeprofessors.ThisdocumenthasbeenorganizedintoOverall descriptionfollowedbythefeaturesandthenthefunctionalandnon-functionalrequirements.The document my be read to desire of thereader.

##### Project Scope

Theprojectisdesignedtohelptheteachersandstudentsmanagetheircollegeactivities.Itconsists ofrelationaldatabasesofstudents,departments,faculty,coursesoftheentireuniversity.Usingthese databases,variousfunctionsthatincludeAttendancemanagement,marksmanagementandleaveman- agementareprovided.Withinattendancemanagement,ateachercanentertheattendancestatusof each student for each course with their respective dates. Similar to attendance, Internal andSemester end marks can also be entered for eachstudent.

##### References

* SoftwareEngineering-APractitionersapproachbyRogerSPressman
* FundamentalsofdatabasesystemsbyRamezElmarsiandShamkantNavathe

#### OverallDescription

##### Product Perspective

ThisprojectismodeledbasedonthecurrentERPsysteminthecollege.Studentsandteachersface severalproblemswhileusingthesystem.Therefore,wewantedtobuildasystemthathaslessernumber offeaturesthanthecurrentsystembut,hasmorefunctionality.

##### Product Features

* + - * Eachteacherwillbeabletoenterattendanceandmarksfortheirrespectivestudents.
      * Eachstudentwillbeabletoviewtheattendancestatusfortheirrespectivecourses.
      * Theteacherswillbeabletoapplyforvarioustypesofleavedirectlythroughthesystem.
      * ThestudentswillbeabletoCommunicateandprovidefeedbacktotheirteachers.
      * Thestudentswillhaveaccesstoaforumpagewheretheyarecommunicatewilleachother.

Theadministratorwillbeabletoviewandupdateinformationsuchasdepartments,classes, teachers, students,courses.

*•*

##### User Classes and Characteristics

ThereareseveraltypesofendusersforthecollegeERPsystem.TheyarebroadlydividedasStudents, StaffandtheAdministrator.Eachoftheseclasseshavetheirownsetoffeatures.

The student should have the following features:

* + - * ViewtheAttendancestatusofthecoursestowhichtheyareenrolled.
      * View the Marks of the courses to which they areenrolled.
      * View the notification from the collegeadministrator.
      * Communicateorgivefeedbacktotheirrespectiveteachers.
      * Communicatewithotherstudentsofthesameuniversity.

The staff should have the following features:

* + - * Accesstotheinformationofallstudentsthatattendtheircourses.
      * AddandedittheAttendancestatusofthosestudents.
      * Add and edit the exam marks of thosestudents.
      * Avail the different types ofleave.
      * Swap classes with other teachers who teach for the sameclass.

The administrator should have the following features:

* + - * Add and update students, teachers and courses.
      * Assign teachers and students tocourses

##### Operating Environment

The operating environment for College ERP system are listed below:

* + - * Operating System: Windows10
      * Database: MySQLdatabase
      * Front end:HTML/CSS/Bootstrap
      * Back end:Django

#### Systemfeatures

##### Expected requirement: Student and staff information

**Description and priority** Information regarding students, teachers and courses are stored inthe database. Every user can view only certain information based on their user class. For example, a teachercanviewstudentandcourseinformationthattheyarehandling.Thisfeatureisofhighpriority astheinformationmustbeviewedbyonlytheauthorizedusers.

##### Functional requirements

* + - * Eachusershallbeabletoviewinformationinthedatabasebasedontheiruserclass.
      * Theadministratorshallbeabletoviewalltheinformationinthedatabase.

##### Normal requirement: Attendance and marks entry

**Descriptionandpriority**AttendanceandmarksentryisthemainfeatureoftheCollegeERPsystem. Hence,thepriorityishigh.Teachersupdatetheattendanceandmarksofthestudentswhoarepartof herclass.StudentscanviewtheirrespectiveAttendanceandmarksofthecoursestheyhavetaken.

##### Functional requirements

Teachersshallbeabletoview,updateandedittheattendanceandmarksofthestudents,partof their class.

*•*

* + - * Teachershallbeabletotakeextraclasses,switchclasseswithotherteachers.

##### Exciting requirement: Communication among students and teachers

**Descriptionandpriority**Studentsandteacherwillbeabletocommunicatewitheachotherdirectly usingtheERPsystem.Studentsmaygivetheirqueriesandfeedbacktoateacherandtheymayrespond accordingly.Thepriorityofthisfeatureislowascostofimplementationcouldbeveryhigh.Asimple version of this feature is to beimplemented.

##### Functional requirements

* + - * Studentsshallbeabletocommunicatewiththeirteachersbysendspersonalmessages.
      * Studentsshallbeabletocommunicatewithotherstudentsthroughaforumsection.

#### External InterfaceRequirements

##### User Interfaces

TheUserinterfaceismadeusingBootstrap.Firstly,therewillbeasimpleloginpageseparatefor studentsandteachers.Eachstudentandteacherwillhaveauniqueinterface.Therewillbeafixed sidebarwithlinkstoallthemodules.Theteacherswillbeabletoviewtheirrespectivestudentsand updatetheirattendanceandmarksusinganeffortlessinterface.

##### Hardware Interfaces

Sinceneitherthemobileapplicationnorthewebportalhaveanydesignatedhardware,itdoesnothave anydirecthardwareinterfaces.Anybrowsercanbeusedtoaccessthewebapp.

##### Software Interfaces

The following is a list of software used in making of the project.

Operating System: We have chosen Windows operating system for its best support and user- friendliness.

*•*

Django:WehavechosentouseDjangofortheback-endofthewebsiteasDjangoisasimple python framework and is suitable forbeginners.

*•*

* + - * Database:WeareusingSQLitedatabase,whichcomesasdefaultwithDjango.

##### Communications Interfaces

Thisprojectistobedeployedanonlinewebsite.Alltheuserscanconnecttothedatabaseserverfrom anywhere and have access to theirinformation.

#### Non-functionalrequirements

##### Safety requirements

Ifthereisextensivedamagetoawideportionofthedatabaseduetocatastrophicfailure,suchasa diskcrash,therecoverymethodrestoresapastcopyofthedatabasethatwasbackeduptoarchival storage(typicallytape)andreconstructsamorecurrentstatebyreapplyingorredoingtheoperations ofcommittedtransactionsfromthebacked-uplog,uptothetimeoffailure.

##### Security requirements

Thedatabasecontainssensitiveinformationofallthestudentsandstaff.Therefore,optimalsecurity measuresmustbetakentoensuredataissafefromunauthorizedusers.

##### Software Quality Attributes

**Availability:**Theusersmustalwaysbeabletoviewtheirinformationsothattheycankeeptrack regularly.

**Correctness:**Theinformationaboutattendanceandmarksmustbecorrecttonotfeedwrongin- formation to theusers.

**portability:**TheusersaccesstheERPfromvariousplatformssuchasdesktopsandmobilephones. Thewebappmustbeportabletoallplatformsandtheuserexperiencemustbeoptimal.

### Validation

Requirementsvalidationexaminesthespecificationtoensurethatallsoftwarerequirementshavebeen statedunambiguously,sothatinconsistencies,omissions,anderrorshavebeendetectedandcorrected.

Thischecklistisalistofquestionsthathelpsustovalidateourrequirements.Theyareasfollows Arerequirementsstatedclearly?Cantheybemisinterpreted?

*•*

**A:**Therewillbeachanceofmisinterpretingtherequirementsspecifiedbythestakeholders.butwe havecollectedrequirementsfrommanysourcesandthoserequirementsareunderstoodcorrectly.

Isthesource(e.g.,aperson,aregulation,adocument)oftherequirementidentified?Hasthefinal statementoftherequirementbeenexaminedbyoragainsttheoriginalsource?

*•*

**A:**Yesallthesourcesoftherequirementsarecorrectlyidentified.Andalltherequirementsare verified.

Does the requirement violate any system domain constraints?

*•*

**A:**Thoserequirementsviolatingthesystemdomainconstraintswereomittedduringthenegotiation ofrequirements.Sonorequirementsareviolatingthesystemdomainconstraint.

Is the requirement testable?

*•*

**A:**Alltherequirementscollectedareunambiguous,clearandprecise.Thismakestherequirements testable.

Is the requirement traceable to any system model that has been created?

*•*

**A:**Yestherequirementistraceablei.e.,theabilitytodescribeandfollowthelifeofarequirement inbothaforwardsandbackwardsdirection(i.e.,fromitsorigins,throughitsdevelopmentand specification, to its subsequent deployment and use, and through periods of ongoing refinement and iteration in any of thesephases)

### Requirements Management

Requirementsmanagementcanbedefinedasaprocessofeliciting,documenting,organizing,andcontrol- lingchangestotherequirements.Generally,theprocessofrequirementsmanagementbeginsassoonas therequirementsdocumentisavailable,but’planning’formanagingthechangingrequirementsshould start during the requirements elicitationprocess.

The essential activities performed in requirements management are listed below.

1. Recognizing the need for change in therequirements
2. Establishingarelationshipamongststakeholdersandinvolvingthemintherequirementsengineer- ingprocess
3. Identifying and tracking requirementsattributes.

Requirementsmanagementenablesthedevelopmentteamtoidentify,control,andtrackrequirements and changes that occur as the software development process progresses. Other advantages associated with the requirements management are listedbelow.

**Bettercontrolofcomplexprojects:**Thisprovidesthedevelopmentteamwithaclearun- derstandingofwhat,when,andwhythesoftwareistobedelivered.Theresourcesareallocated accordingtouser-drivenprioritiesandrelativeimplementationeffort.

*•*

**Improvedsoftwarequality:**Thisensuresthatthesoftwareperformsaccordingtotherequire- mentstoenhancesoftwarequality.Thiscanbeachievedwhenthedevelopersandtestershavea precise understanding of what to develop andtest.

*•*

**Reduced project costs and delays:** This minimizes errors early in the development cycle as itisexpensiveto’fix’errorsatthelaterstagesofthedevelopmentcycle.Asaresult,theproject costs alsoreduce.

*•*

**Improvedteamcommunication:**Thisfacilitatesearlyinvolvementofuserstoensurethattheir needs areachieved.

*•*

#### Requirements changemanagement

Requirementschangemanagementisusedwhenthereisarequestorproposalforachangeinthere- quirements.Theadvantageofthisprocessisthatthechangestotheproposalsaremanagedconsistently andinacontrolledmanner.Notethatmanyactivitiesofrequirementsmanagementarelikesoftware configuration managementactivities.

Anefficientrequirementchangemanagementprocessundergoesanumberofstagesforchangesto the requirements. These stages are listedbelow.

1. **Problemanalysis and change speciftcation:**Theentireprocessbeginswithidentificationof problemstotherequirements.Theproblemorproposalisanalyzedtoverifywhetherthechange isvalid.Theoutcomeoftheanalysisisprovidedtothe’changerequester’andamorespecific requirements change proposal is thenmade.
2. **Changeanalysisandcosting:**Theeffectofachangerequestedontherequirementisassessed accordingtotraceabilityinformation.Thecostforthiscanbeestimatedonthebasisofmodifica- tionmadetothedesignandimplementation.Aftertheanalysisisover,adecisionismadewhether changes are to bemade.
3. **Changeimplementation:**Finally,thechangesaremadetotherequirementsdocument,system designandimplementation.Therequirementsdocumentisorganizedinsuchamannersothat changestoitcanbemadewithoutextensiverewriting.Minimizingtheexternalreferencesand making document sections modular achieves changeability in the document. By doing this, indi- vidualsectionscanbechangedandreplacedwithoutaffectingotherpartsofthedocument.

## Chapter 3

**System Design**

Various Design concepts and processes were applied to this project. Following concepts like separation ofconcerns,thesoftwareisdividedintoindividualmodulesthatarefunctionallyindependentandin- corporatesinformationhiding.Thesoftwareisdividedinto3moduleswhicharestudents,teachersand administrators. We shall look at each module indetail.

### Student

Eachstudentbelongstoaclassidentifiedbysemesterandsection.Eachclassbelongstoadepartment andareassignedasetofcourses.Therefore,thesecoursesarecommontoallstudentsofthatclass.The studentsaregivenauniqueusernameandpasswordtologin.Eachofthemwillhaveadifferentview. These views are describedbelow.

##### Student information

*•*

Eachstudentcanviewonlytheirownpersonalinformation.Thisincludestheirpersonaldetails likename,phoneno,addressetc.Also,theycanviewthecoursestheyareenrolledinandthe attendance, marks of each ofthose.

##### Attendance information

*•*

Attendanceforeachcoursewillbedisplayed.Thisincludesthenumberofattendedclassesand theattendancepercentage.Iftheattendancepercentageifbelowaspecifiedthreshold,say75%, Itwillbemarkedinredotherwiseitbeingreen.Therewillalsobeadaywiseattendanceview foreachcoursewhichshowsthedateandstatus.Thiswillbepresentedinacalenderformat.

##### Marks information

*•*

Therewillbe5eventsand1semesterendexaminationforeachcourse.Themarksforeachof these will be provided in the ERPsystem.

##### Notiftcations and events

*•*

Thissectioniscommontoallstudents.Notificationaremessagesfromtheadminsuchasdeclara- tionofholidays,testtime-tableetc.Theeventsandtheirdetailsarespecifiedhere.

### Teacher

Eachteacherbelongstoadepartmentandareassignedtoclasseswithacourse.Teacherswillalsohave ausernameandpasswordtologin.Thedifferentviewsforteachersaredescribedbelow.

##### Information

*•*

Theteacherswillhaveaccesstoinformationregardingthecoursesandclassestheyareassigned to. Detailsofthecoursesincludethecredits,thesyllabusplan. Detailsoftheclassincludethe department,semester,sectionandthelistofstudentsineachclass.Theteacherwillalsohave accesstoinformationofstudentswhobelongtothesameclassasastheteacher.

##### Attendance

*•*

Theteacherhastheabilitytoaddandalsoedittheattendanceofeachstudent.Forenteringthe attendance,theywillbegiventhelistofstudentsineachclassandtheycanentertheattendance ofthewholeclassonadaytodaybasis.Therewillbetworadiobuttonsnexttoeachstudent name,oneforpresentandtheotherforabsent.Therewillalsobeanoptionforextraclasses. Teacherscanedittheattendanceofeachstudenteitherforeachstudentindividuallyorforthe wholeclass.

##### Marks

*•*

Theteachercanenterthemarksforthe5eventsand1SEEforeachcoursetheyareassigned. Theyalsohavetheabilitytoeditthemarksincaseofanychanges.Reportssuchasthereport cardincludingallthemarksandCGPAofastudentcanbegenerated.

### Administrator

Theadministratorwillhaveaccesstoalltheinformationinthedifferenttablesinthedatabase.They willaccesstoallthetablesinalistform.Theywillbeabletoaddaentryinanytableandalsoedit them.Thedesignoftheviewfortheadminwillprovideamodularinterfacesothatqueryingthetables willbeoptimized.Theywillbeprovidedwithsearchandfilterfeaturessothattheycanaccessdata efficiently.

### Class Diagram

Theclassdiagramstatesthedifferentclassesinvolvedinthesoftware.Foreachclass,asetofattributes andmethodareincluded.Therelationshipbetweentheclassesarealsospecified.Forexample,the teacherclasshastheattributesId,name,phoneno,addressandmethodssuchasmarkingattendance, declaringmarksandpreparingreportcards.Eachinstanceoftheteacherclassbelongstoadepartment. ThisisspecifiedbytherelationshipbetweenTeacherandDepartmentclasses.

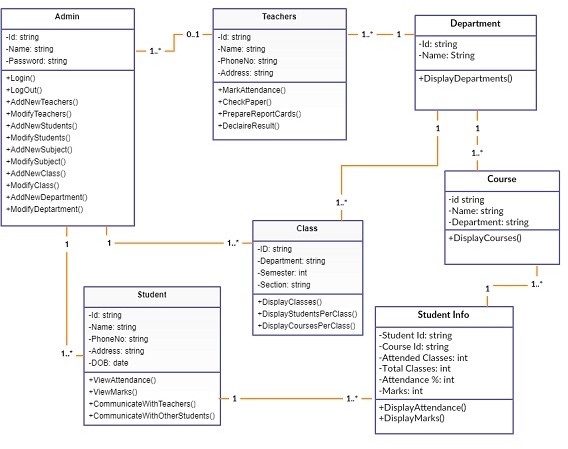


Figure 3.1: Class diagram of college ERP

### Entity RelationshipDiagram

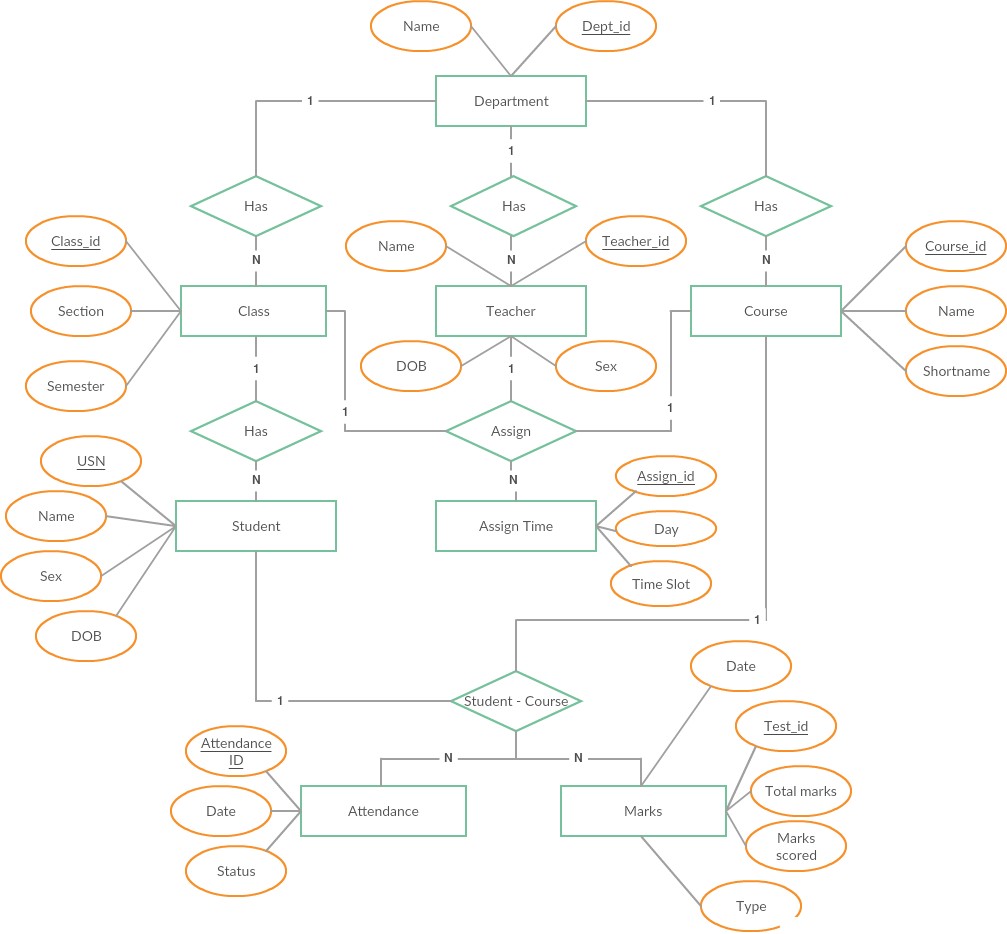


Figure 3.2: Entity Relationship diagram of college ERP

### Architectural design

TheERPsoftwarerequiresthearchitecturaldesigntorepresentthedesignofthesoftware.Herewe defineacollectionofhardwareandsoftwarecomponentsandtheirinterfacestoestablishtheframework for the development of thissoftware.

Thereexistsnumberofcomponentsofthesystemwhichareintegratedtoformasystem.Thesetof connectorswillhelpincoordination,communication,andcooperationbetweenthecomponents.The ERPsoftwareisbuiltforcomputer-basedsystem.Itexhibitsthedatacentricstyleofarchitecture.

#### Architectural style

InthecollegeERPsoftware,thedatabasestoresthedataofallthestudentsandfacultiesandthestored dataisupdated,added,deletedormodified.Soitexhibitsthe**datacentricarchitecturalstyle.**

Inthisarchitecturedifferentcomponentscommunicatewiththeshareddatarepository.Thecomponents accessashareddatastructureandarerelativelyindependent.

The components are:

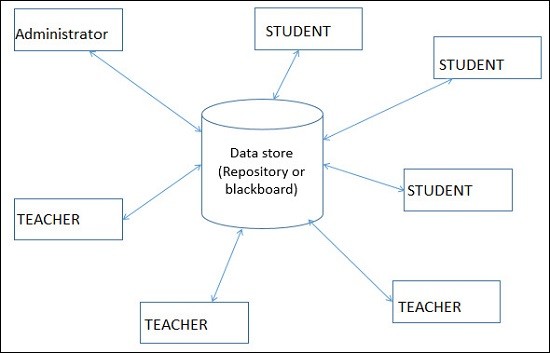


Figure 3.3: Data Centric architectural style

##### Central data

Alsoknownasdatastoreordatarepository,whichisresponsibleforprovidingpermanentdata storage. It represents the current state. It stores the information of students, attendance of studentsandfacultiesofeachday,salaryofallthefacultiesetc...

##### Data accessors

Dataaccessorsoneofthecomponents,theyarealsocalledasclients.Adataaccessoroperates onthecentraldatastore,performcomputations,andmightputbacktheresults.Whichincludes students,facultiesandadministrator.Studentsrequeststoaccessthedatafromtherepository andgetstherequestserviced.Facultymembersmodifythedataintherepository.Administrator can add or delete theclients.

##### interface

Interfaceistheconnectingcomponentbetweendatarepositoryandclients’clientinteractwith the data through the webserver.

Theoperationofoneclientdoesnotdependontheothers.Theyareindependentofeachother. Thisdata-centeredarchitecturewillpromoteintegrability.Thismeansthattheexistingcompo- nentscanbechangedandnewclientcomponentscanbeaddedtothearchitecturewithoutthe permissionorconcernofotherclients.Additionofremovalofstudentsandfacultiescanbedone withoutthepermissionofotherstudentsandfaculties.

## Chapter 4

**System Implementation**

ThecollegeERPsystemhasthreemainuserclasses.Theseincludethestudents,teachersandad- ministrator.Thissectionwillexplainindetailallthefeaturesandtheworkingofthoseforeachuser class.

### Student

#### Login

Eachstudentinthecollegeisassignedauniqueusernameandpasswordbytheadministrator.Theuser- nameisthesameastheirUSNandsoisthepassword.Theymaychangeitlateraccordingtotheirwish.

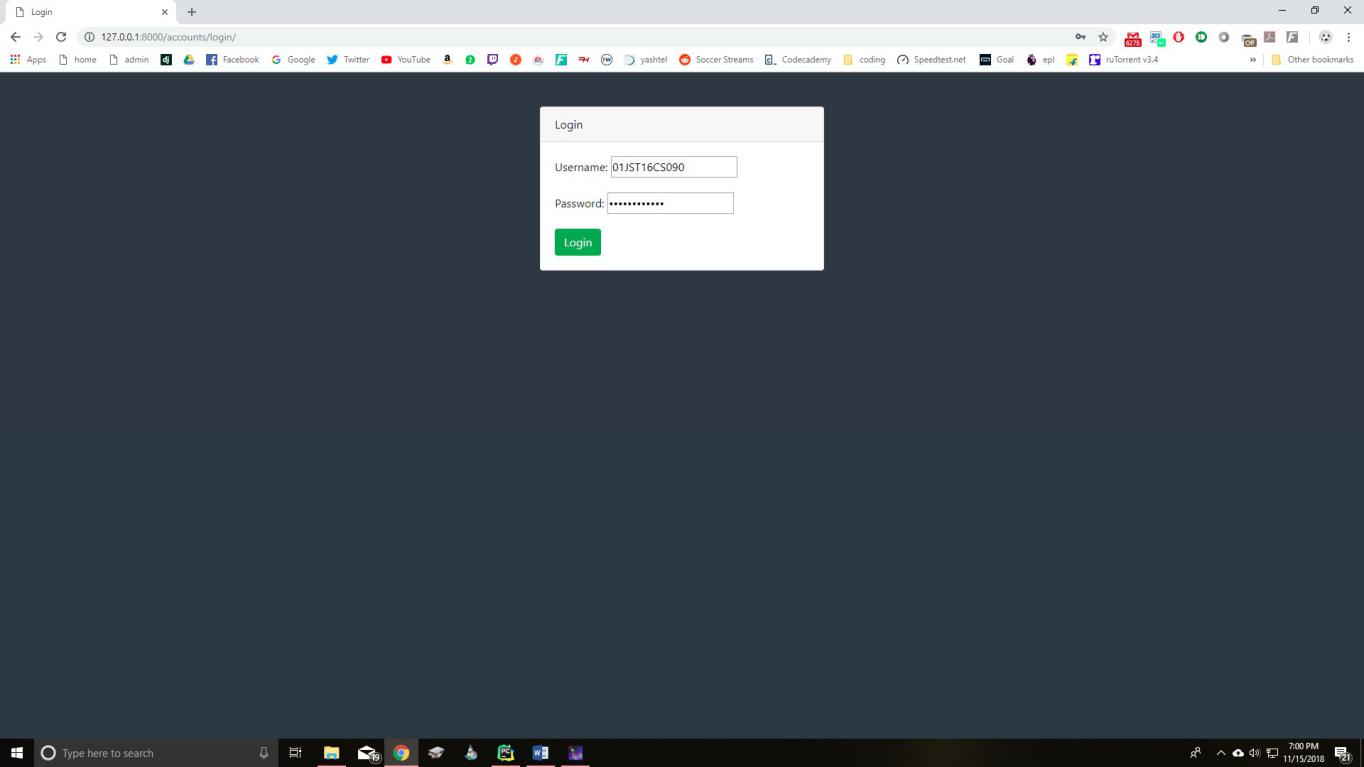


Figure 4.1: Student Login Page

#### Homepage

Aftersuccessfullogin,thestudentispresentedahomepagewiththeirmainsections,attendance,marks andtimetable.Intheattendancesectionthestudentcanviewtheirattendancestatuswhichincludes thetotalclasses,attendedclassesandtheattendancepercentageforeachoftheircourses.

Inthemarkssection,thestudentcanviewthemarksforeachoftheircoursesoutof20for3internal assessments,2events.Also,thesemesterendexaminationfor100marks. Lastly,thetimetableprovides theclassesassignedtothatstudentanddayandtimeofeachinatabularform.

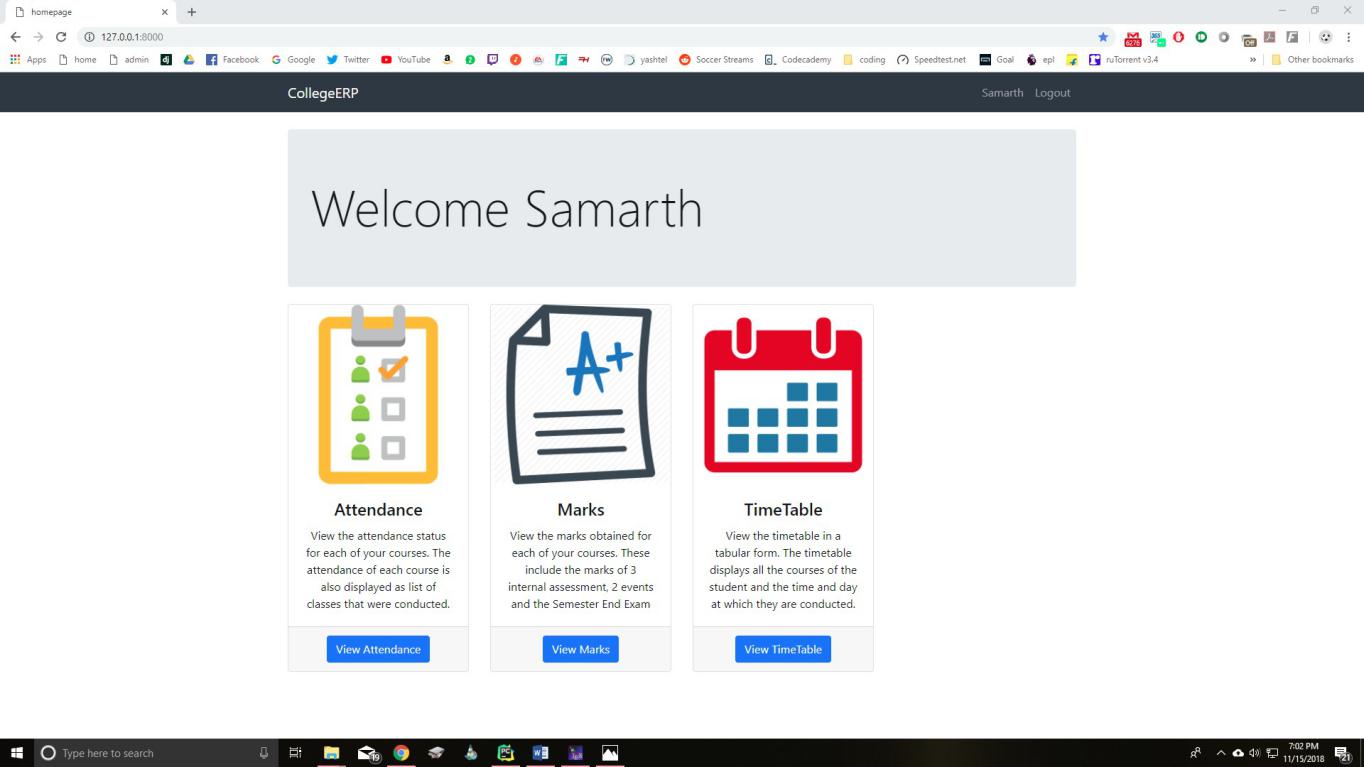


Figure 4.2: Student Home Page

#### Attendance

Ontheattendancepage,thereisalistofcoursesthatisdependentoneachstudent.Foreachcourse, thecourseidandnamearedisplayalongwiththeattendedclasses,totalclassesandtheattendance percentageforthatparticularcourse.Iftheattendancepercentageisbelow75foranycourse,itis displayedinreddenotingshortageofattendance,otherwiseitisgreen.Ifthereisanyshortage,it specifiesthenumberofclassestoattendtomakeupforit.Ifyouclickoneachcourse,ittakesyouto the attendance detailpage.

##### Attendance Detail

Thispagedisplaysmoredetailsfortheattendanceineachcourse.Foreachthecourse,thereisalistof classesconductedandeachismarkedwiththedate,dayandwhetherthestudentwaspresentorabsent on that particulardate.

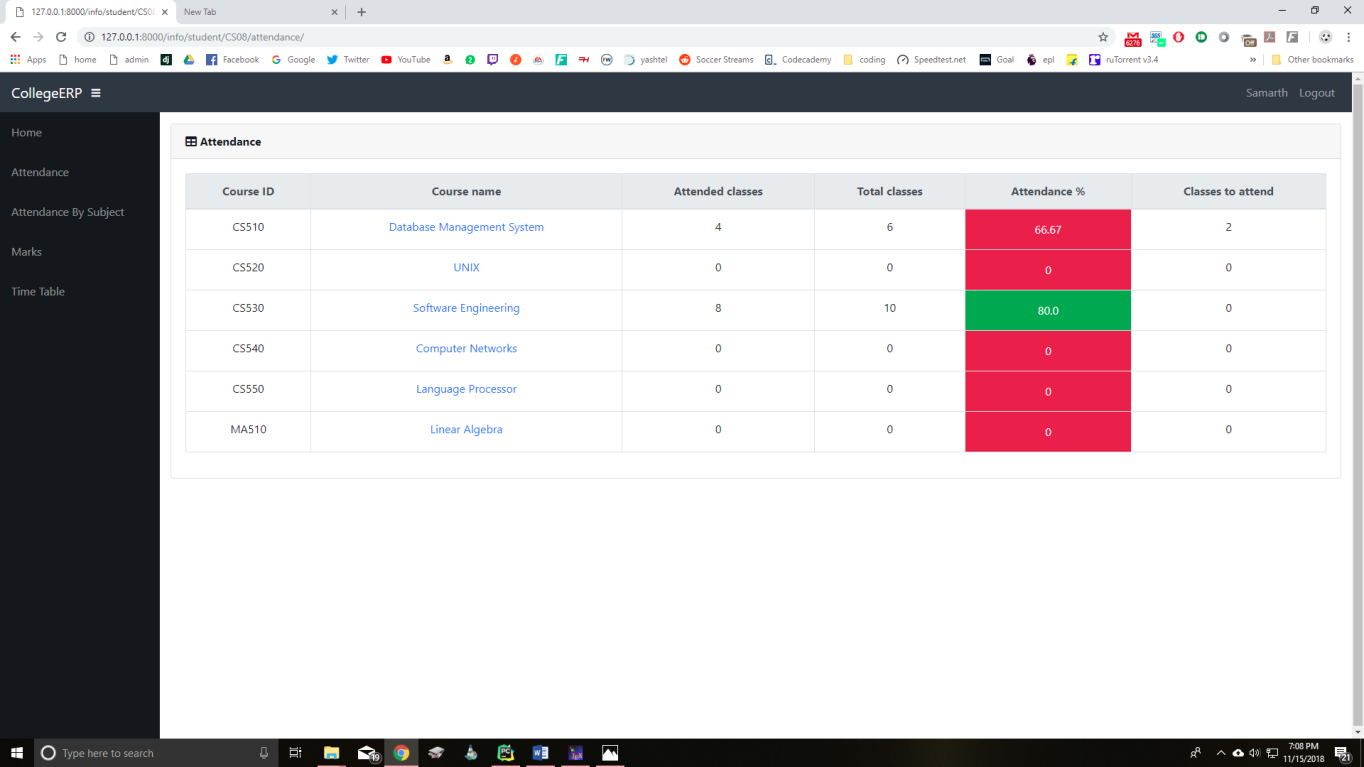


Figure 4.3: Student Attendance Page

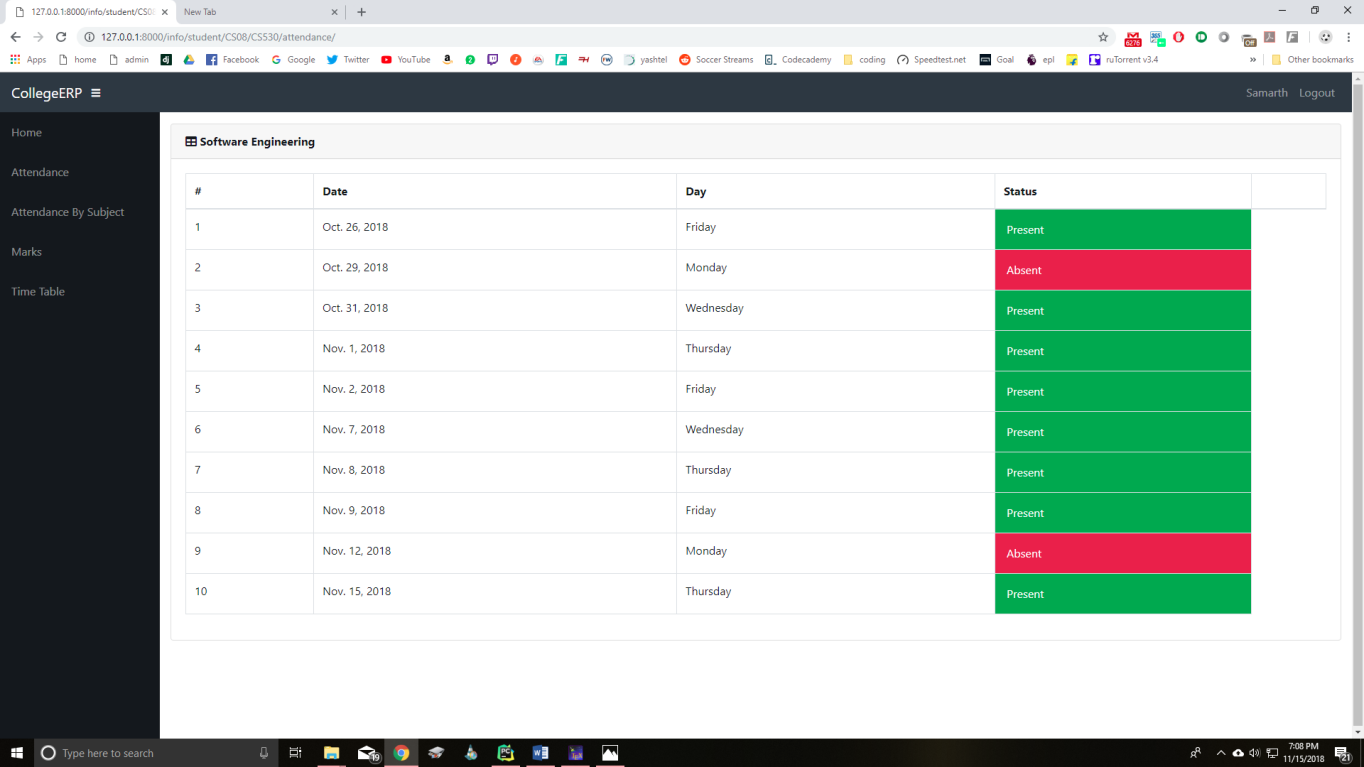


Figure 4.4: Student Attendance Detail Page

#### Marks

TheMarkspageisatablewithanentryforeachoftheircourses.Thecourseidandnamearespecified alongthemarksobtainedineachofthetestsandexams.Thetestsinclude3internalassessmentswith marksobtainedoutofatotalof20,2eventssuchasproject,assignment,quizetc.,withmarksoutof

20. Lastly, one semester end exam with marks out of 100.

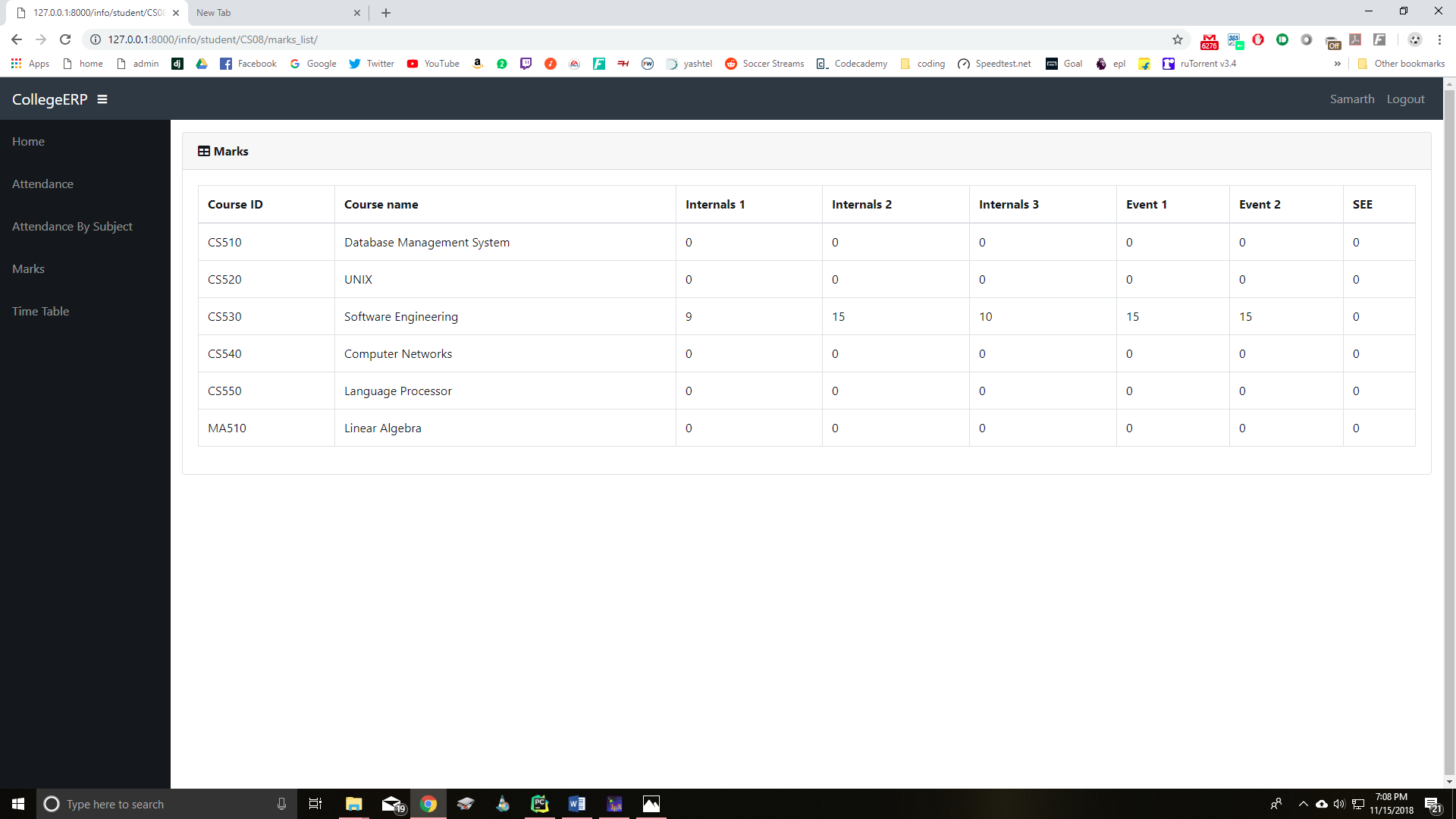


Figure 4.5: Student Marks Page

#### Timetable

Thispageisatablewhichliststhedayandtimingsofeachoftheclassesassignedtothestudent.The rowheadersarethedaysoftheweekandthecolumnheadersarethetimeslots.So,foreachday,it specifiestheclassesinthetimeslots.Thetimetableisgeneratedautomaticallyfromtheassigntable, whichisatablecontainingtheinformationofalltheteachersassignedtoaclasswithacourseandthe timings theclasses.



Figure 4.6: Student Timetable

### Teacher Login

Eachteacherinthecollegeisassignedauniqueusernameandpasswordbytheadministrator.The usernameistheirteacherIDandthesameforpassword.Theteachermaychangethepasswordlater.

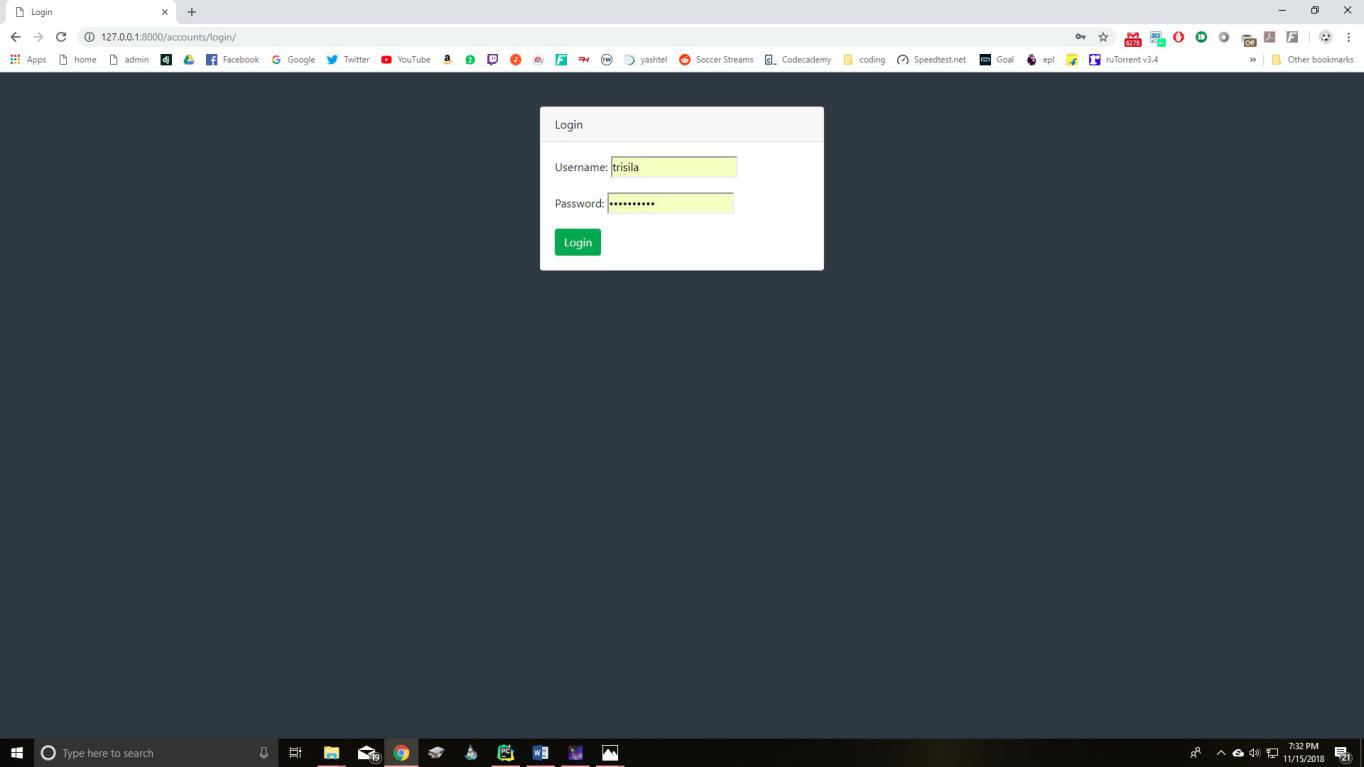


Figure 4.7: Teacher Login

#### Homepage

Aftersuccessfullogin,thestudentispresentedahomepagewiththeirmainsections,attendance,marks, timetableandreports.Intheattendancesection,theteachercanentertheattendanceoftheirrespective studentsforthedaysonwhichclasseswereconducted.Thereisaprovisiontoenterextraclassesand view/edittheattendanceofeachindividualstudent.Inthemarkssection,theteachermayenterthe marksfor3internals,2eventsand1SEEforeachstudent.Theycanalsoediteachoftheenteredmarks. Thetimetableprovidestheclassesassignedtotheteacherwiththedayandtimingsinatabularform. Lastly,theteachercangeneratereportsforeachoftheirassignedclass.

#### Attendance

Thereisalistofalltheclassassignedtoteacher.So,foreachclassthereare3actionsavailable.They are,

##### Enter Attendance

Onthispage,theclassesscheduledorconductedislistedintheformofalist.Initially,allthescheduled classeswillbelistedfromthestartofthesemestertothecurrentdate.Thus,ifthereisclassscheduled fortoday,itwillautomaticallyappearontopofthelist.Iftheattendanceofanydayisnotmarkedit willbered,otherwisegreenifmarked.Classescanalsobecancelledwhichwillmakethatdateasyellow. Whileenteringtheattendance,thelistofstudentsinthatclassislistedandtherearetwooptionsnext

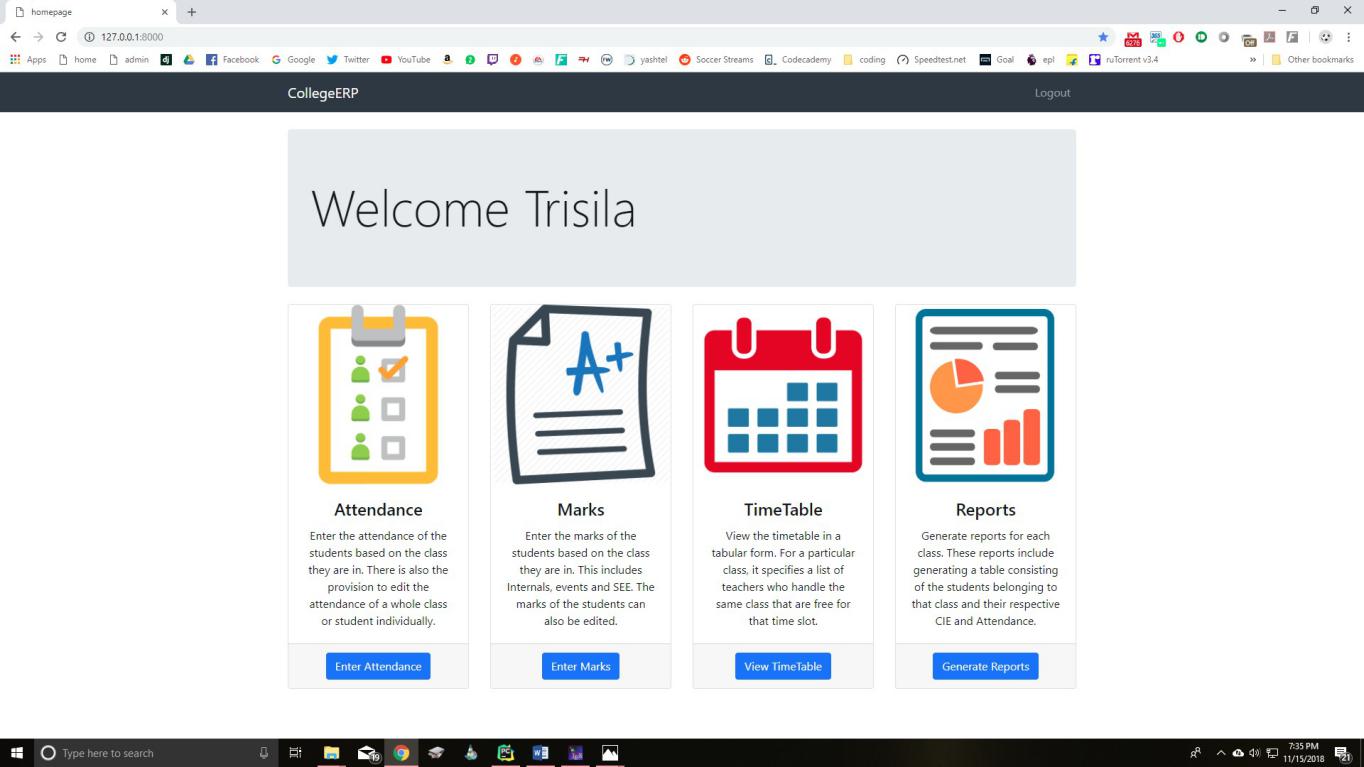


Figure 4.8: Teacher homepage

toeach.Theseoptionsareintheformofaradiobuttonforpresentandabsent.Allthebuttonsare initiallymarkedaspresentandtheteacherjustneedstochangefortheabsentstudents.

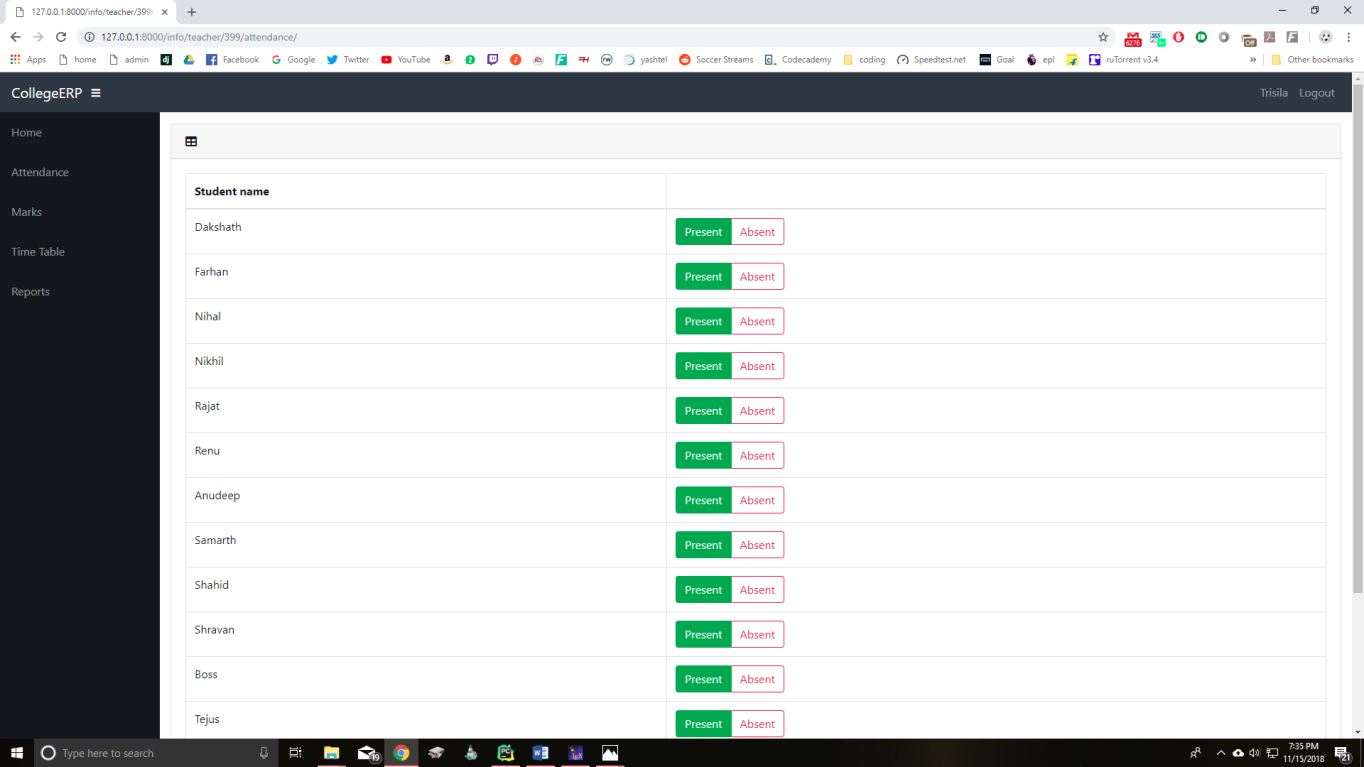


Figure 4.9: Entering attendance

##### Edit Attendance

Afterenteringattendance,theteachercanalsoeditit.Itissimilartoscreenforenteringattendance, onlytheenteredattendanceissavedanddisplay.Theteachercanchangetheappropriateattendance and saveit.

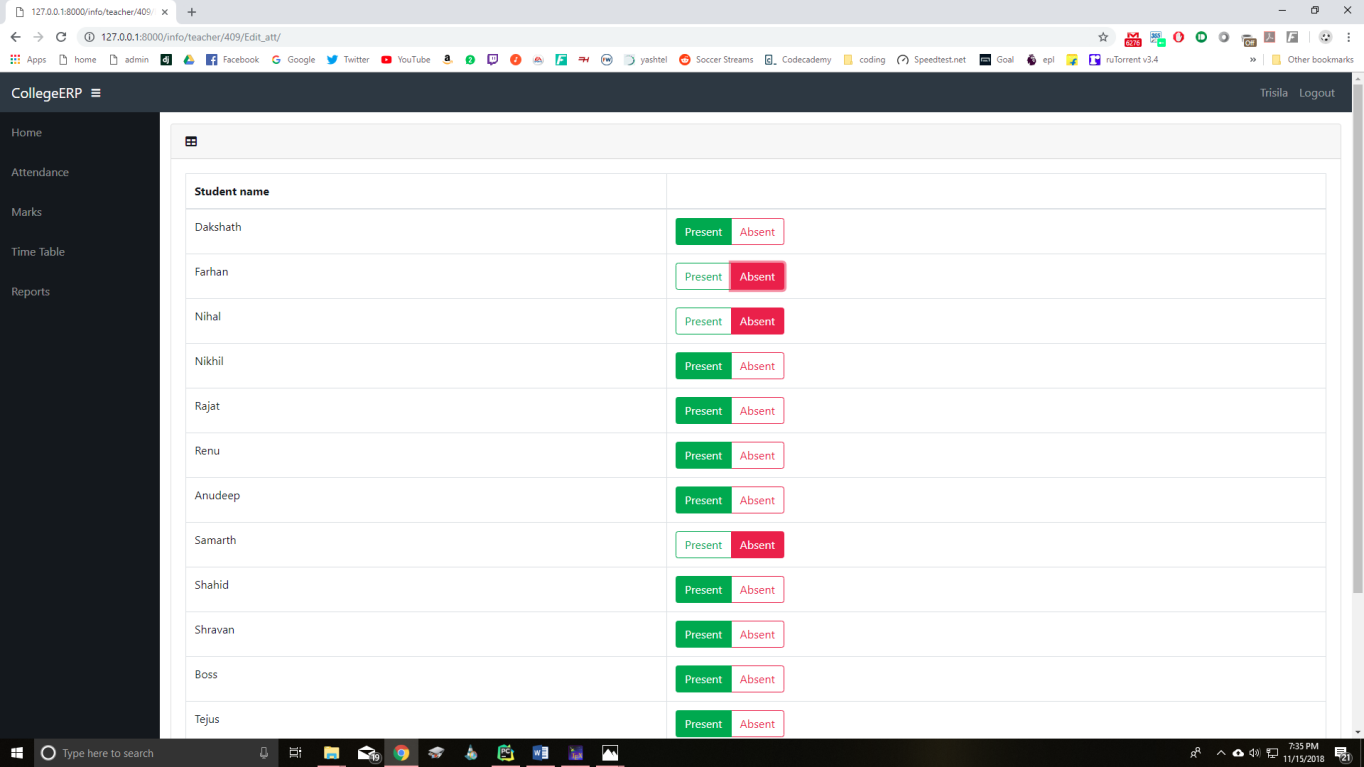


Figure 4.10: Editing attendance

##### Extra Class

Ifateacherhastakenaclassotherthanatthescheduledtimings,theymayentertheattendancefor thataswell.Whileenteringtheextraclass,theteacherjustneedstospecifythedateitwasconducted andentertheattendanceofeachofthestudents.Aftersubmittingextraclass,itwillappearinthelist of conducted classes and thus, it can beedited.

##### Student Attendance

Foreachassignedclass,theteachercanviewtheattendancestatusofthelistofstudents.Thenumber ofattendedclasses,totalnumberofclassesconductedandtheattendancepercentageisdisplayed. Ifthe attendancepercentageofanyofthestudentsisbelow75,itwillbedisplayedinred.Thus,theteacher mayeasilyfindthelistofstudentsnoteligibletotakeatest.

##### Student Attendance Details

Theteachercanviewtheattendancedetailofalltheirassignedstudentsindividually.Thatis,forall theconductedclasses,itwilldisplaywhetherthatstudentwaspresentorabsent.Theteachercanalso edittheattendanceofeachstudentindividuallybychangingtheattendancestatusforeachconducted class.

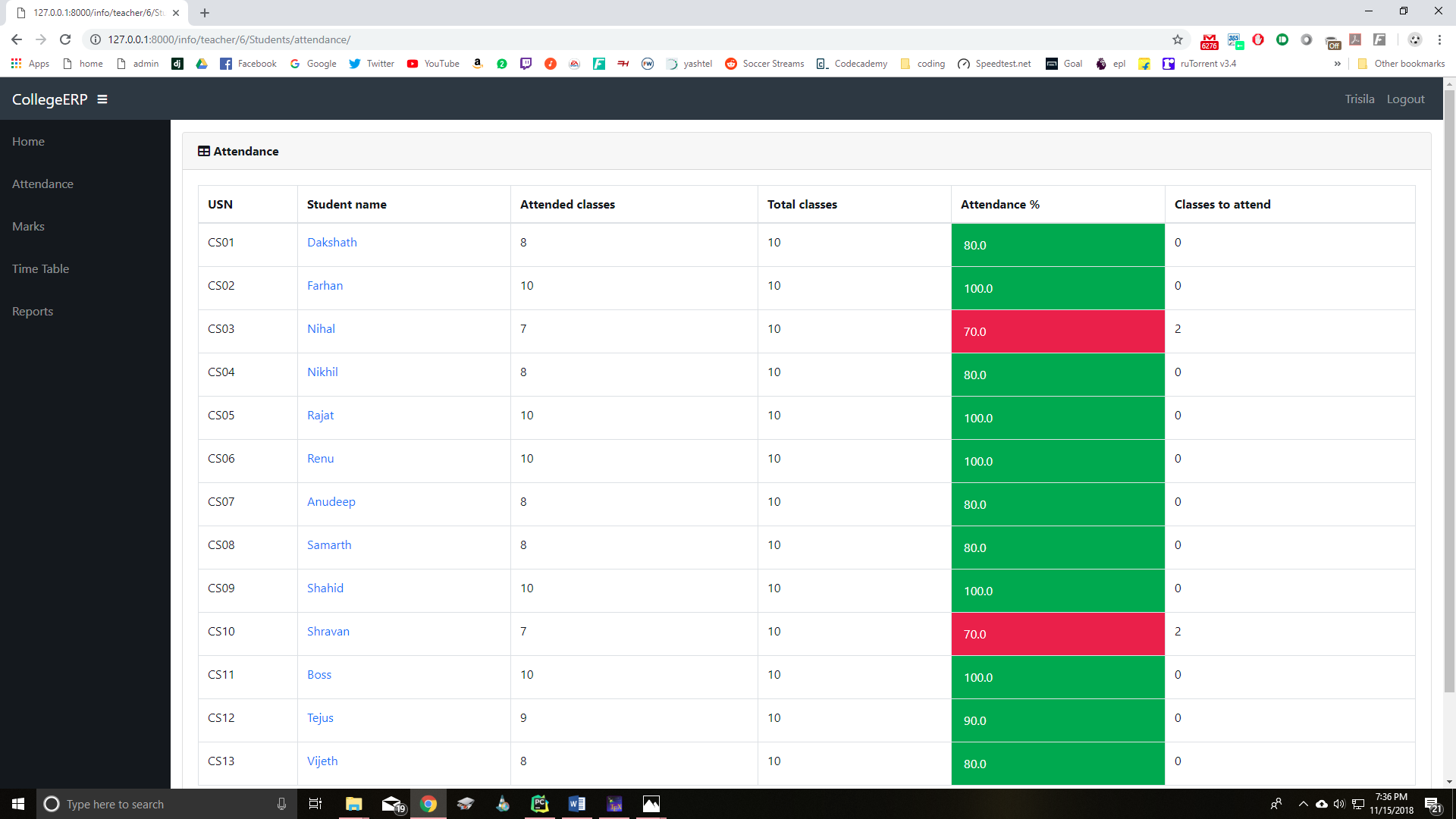


Figure 4.11: Attendance of students in a class

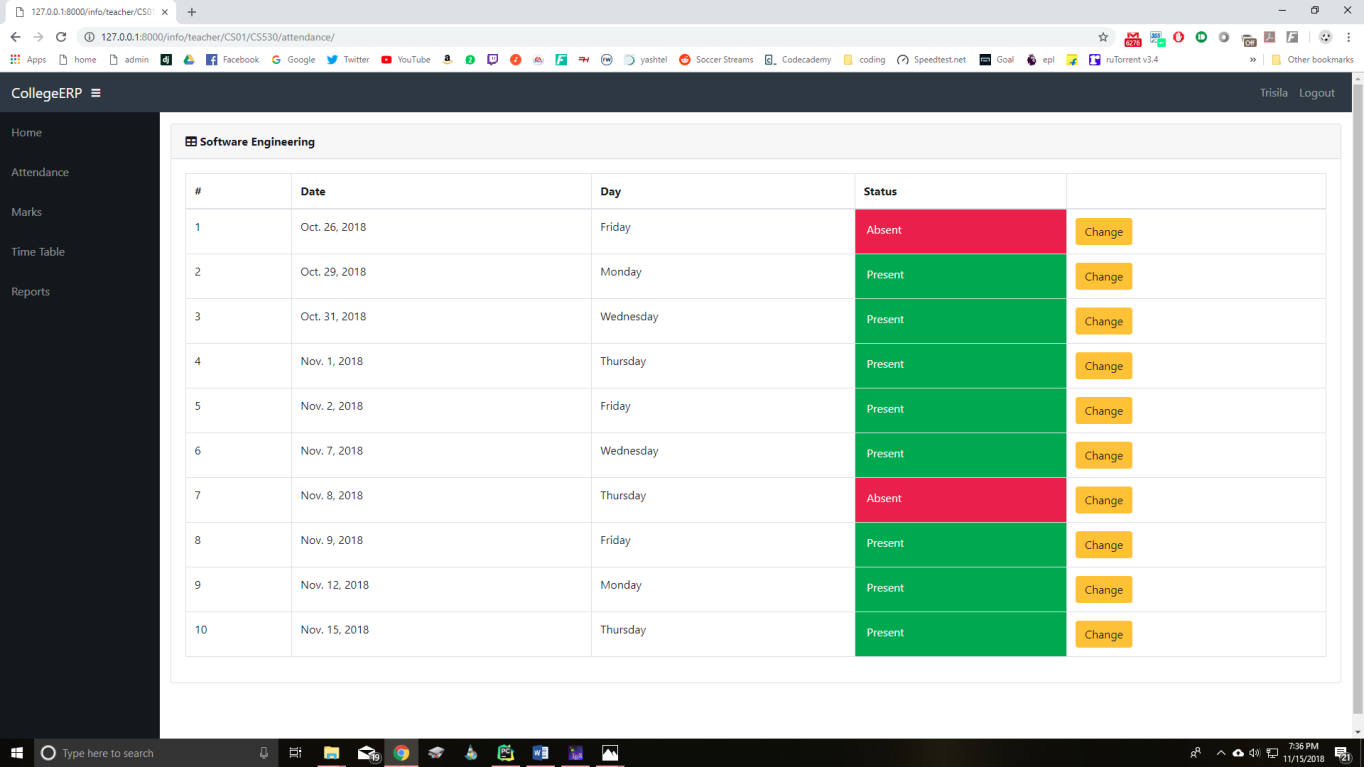


Figure 4.12: Attendance details of an individual student

#### Marks

Onthispage,thelistofclassesassignedtotheteacheraredisplayedalongwithtwoactionsforeach class. These actionsare,

##### Enter Marks

Onthispage,theteachercanenterthemarksfor3internalassessments,2eventsandonesemesterend exam.Initiallyallofthemaremarkedredtodenotethatthemarkshavenotbeenenteredyet.Once themarksforatestisentered,itturnsgreen.Whileenteringthemarksforaparticulartest,thelist ofstudentsinthatclassislistedandmarkscanbeenteredforallofthemandsubmitted.Once,the marksaresubmitted,thestudentscanviewtheirrespectivemarks.Incaseifthereisaneedtochange themarksofanystudent,itispossibletoeditthemarks.

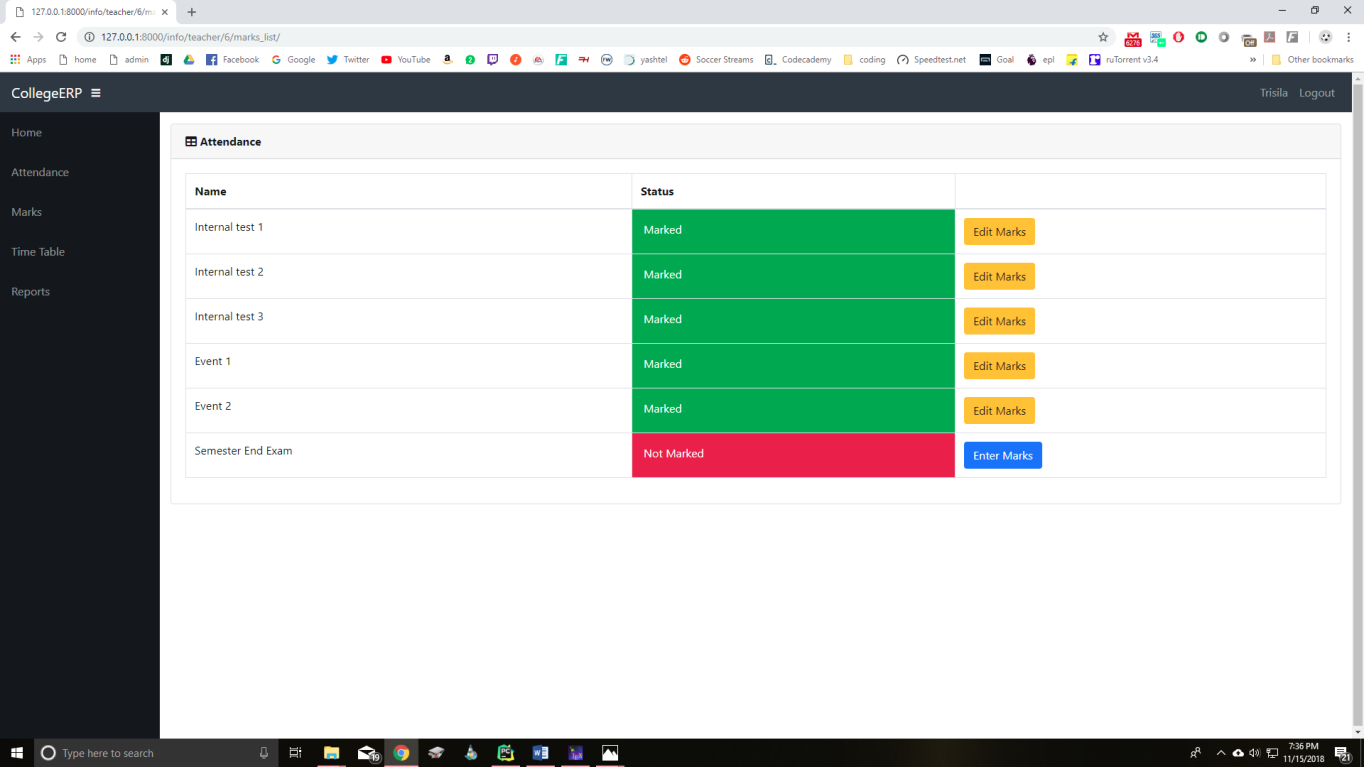


Figure 4.13: Entering marks

##### Edit Marks

Marksforatestcanbeedited.Whileediting,thelistofstudentsinthatclassisdisplayedalongwith alreadyenteredmarks.Themarkstobeupdatedcanbechangedandsubmitted.Thestudentscanview this changeimmediately.

##### Student Marks

Foreachassignedclass,theteacherhasaccesstothelistofstudentsandthemarkstheyobtainedinall the tests. This is displayed in a tabularform.

#### Timetable

Thispageisatablewhichliststhedayandtimingsofeachoftheclassesassignedtotheteacher.The rowheadersarethedaysoftheweekandthecolumnheadersarethetimeslots.So,foreachday,it specifiestheclassesinthetimeslots.Thetimetableisgeneratedautomaticallyfromtheassigntable, whichisatablecontainingtheinformationofalltheteachersassignedtoaclasswithacourseandthe timings theclasses.

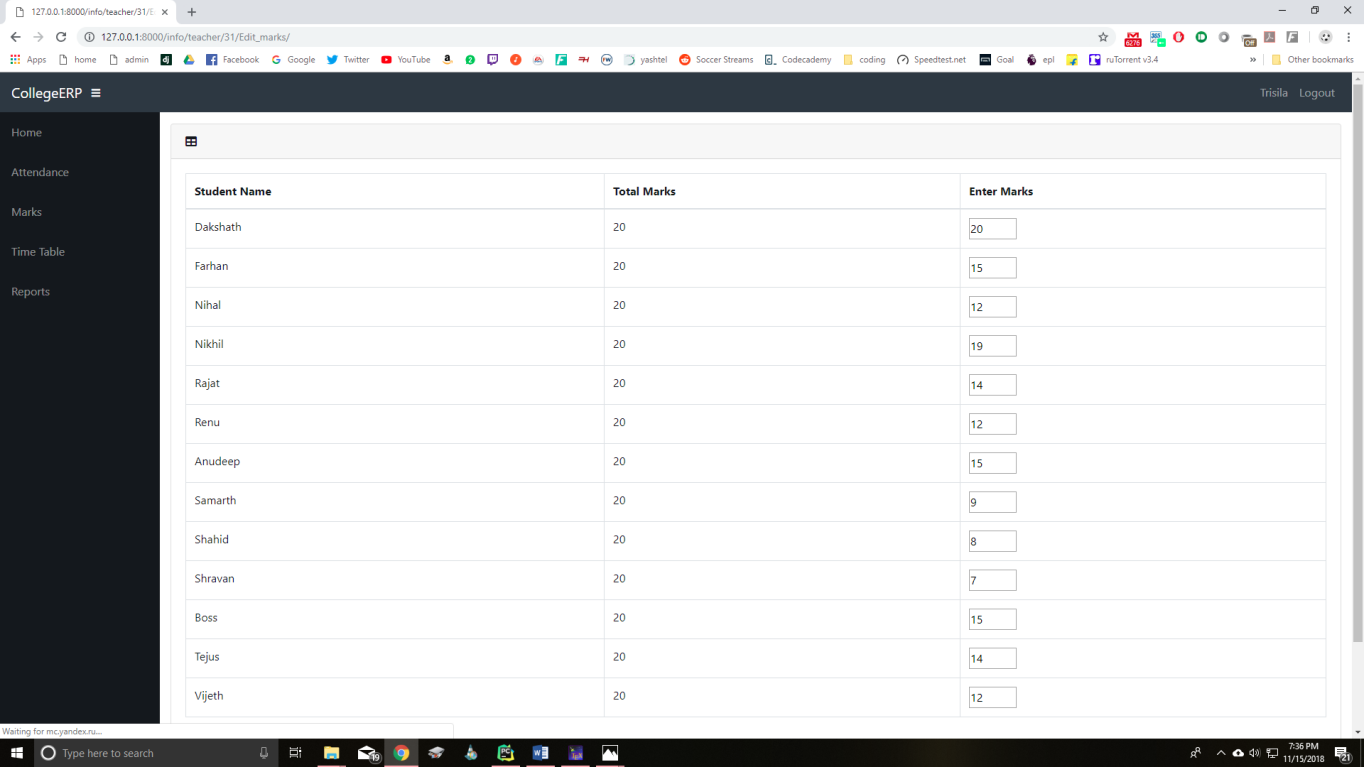


Figure 4.14: Editing marks

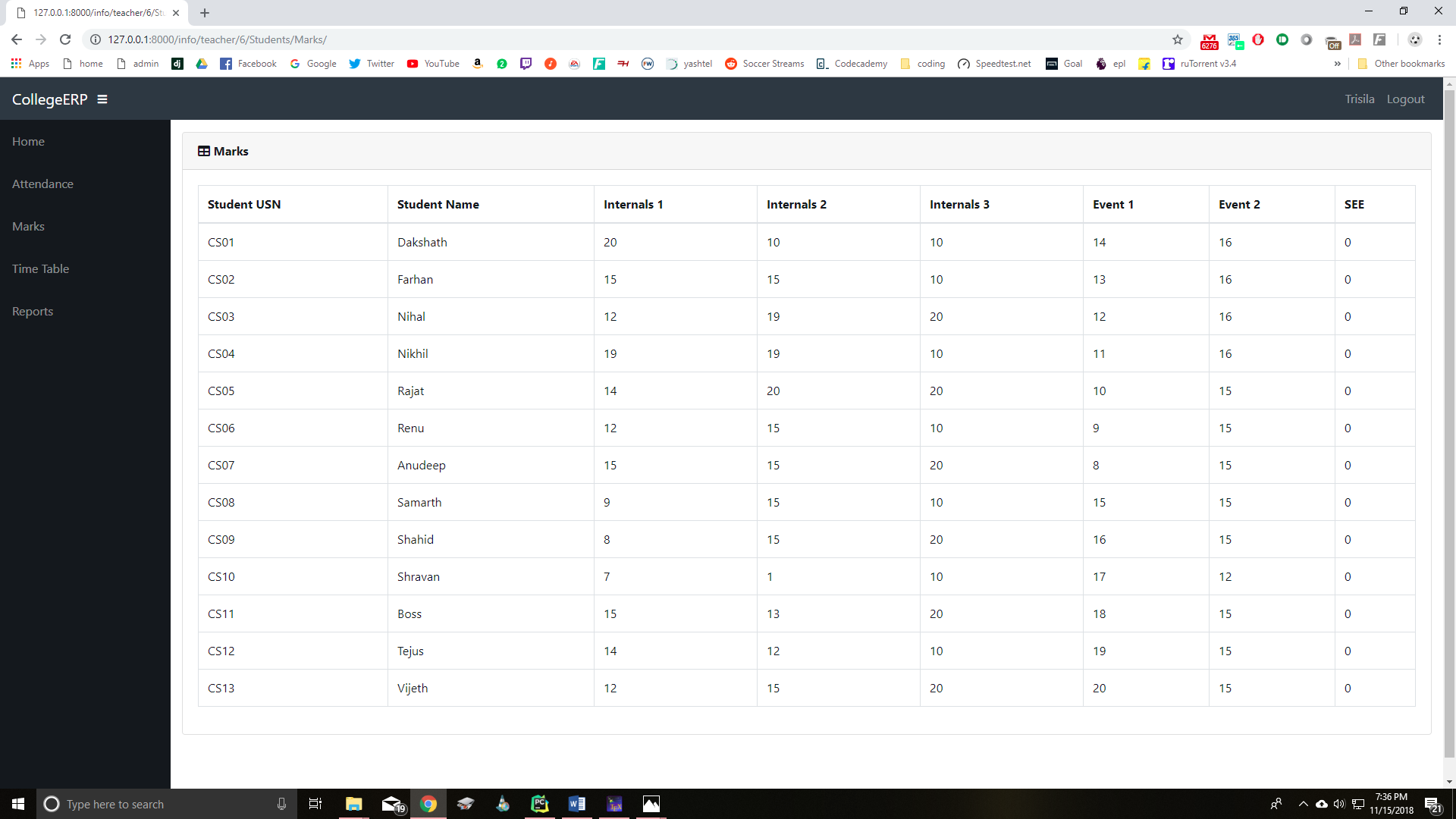


Figure 4.15: Marks of all the students in a class

##### Free teachers

Foreachentryinthetable,thelistoffreeteacherscanbegenerated.Freeteachersaretheteachers whoassignedtotheclassandarefreeforthattimeslotonthatday.Thisisveryusefulfortheteachers particularlywhentheyareonleaveasithelpsthemfindasuitablereplacementarethatclass.

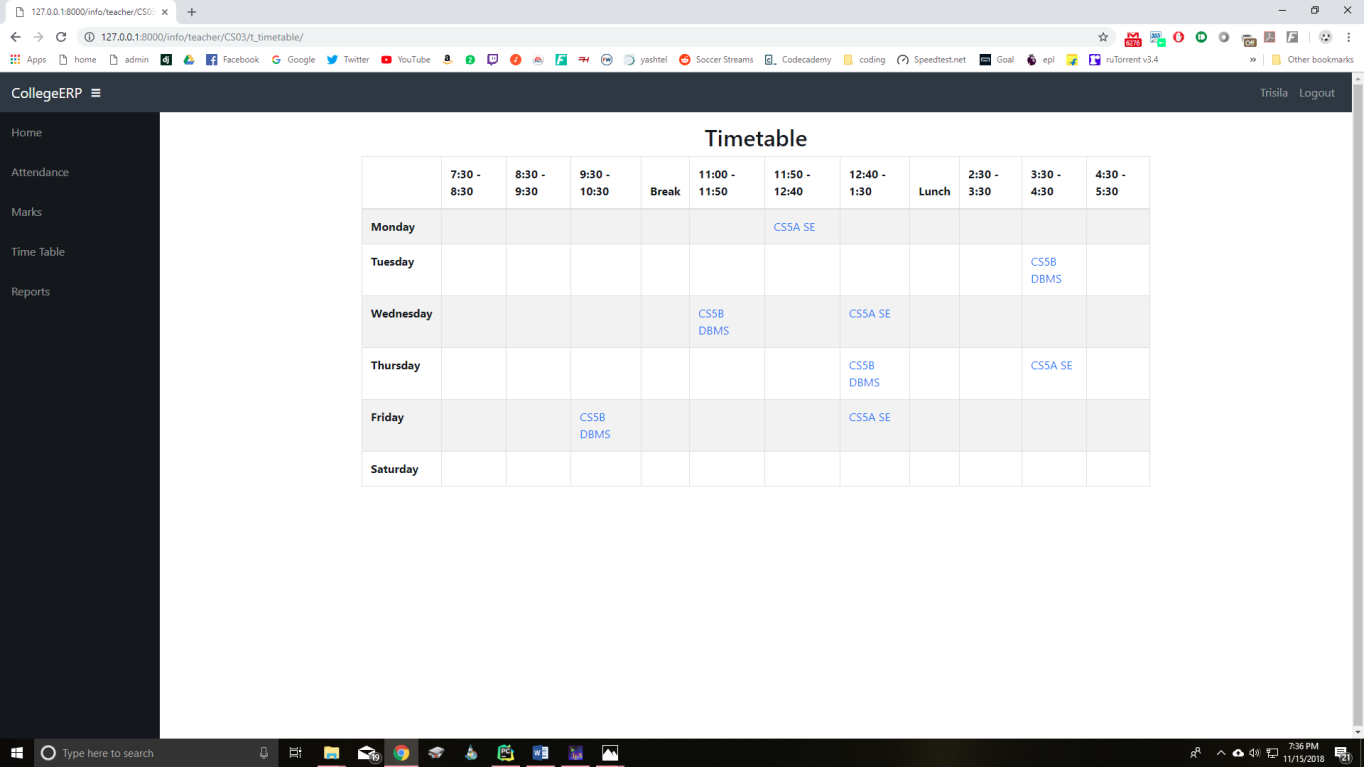


Figure 4.16: Teacher Timetable

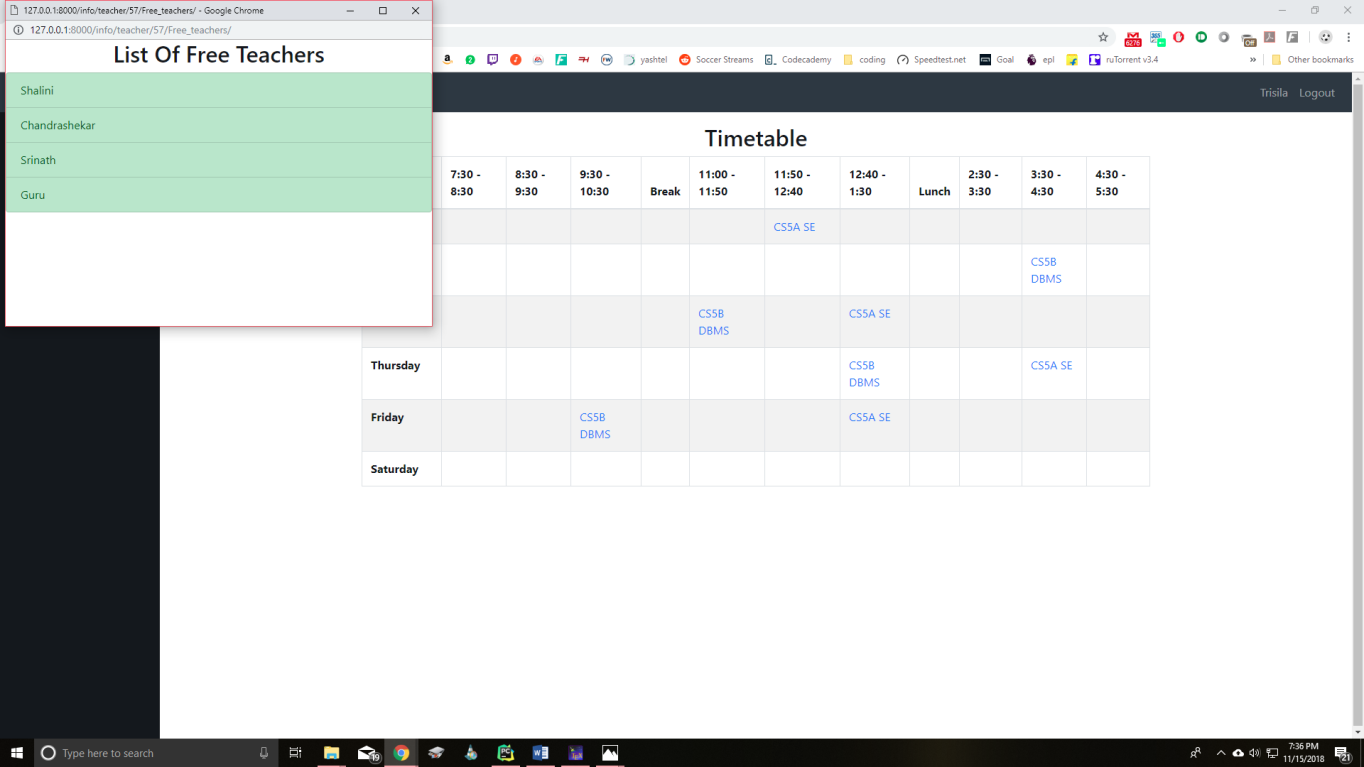


Figure 4.17: List of free teachers for a time slot

#### Reports

Thelastpagefortheteachersisusedtogeneratereportsforeachclass.Thereportspecifiesthelistof studentsinthatclassandtheirrespectiveCIEandattendancepercentage.CIEistheaverageofthe marksobtainedfromthetests,3internalsand2events.TheCIEisoutof50andthestudentswithCIE below25aremarkedinredandarenoteligibletowritethesemesterendexam.Also,theattendance

percentage is displayed with students below 75% marked in red.

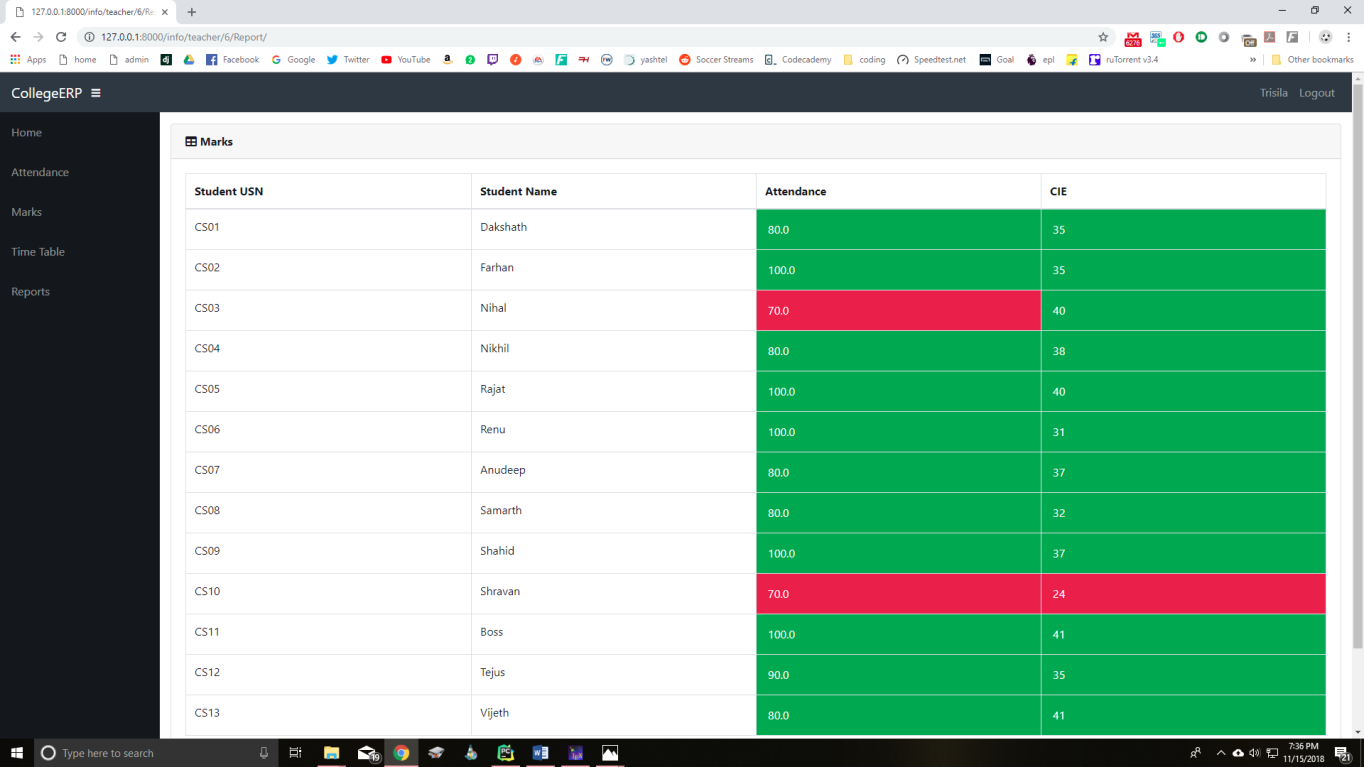


Figure 4.18: CIE and attendance for a class of students

### Administrator

The administrator is responsible for adding and maintaining all the departments, students, teachers, classesandcourses.Allthisdataisstoredinthedatabaseintheirrespectivetables.Theadminis alsoresponsibleforaddingandmaintainingthelistofteachersassignedtoclasswithacourseandthe timings.ThisinformationisstoredintheAssigntable.Theadminalsohasaccesstothemarksand attendance of each student and can modifythem.

Thereareseveralfeaturesinplacetoensurethatqueryingthedatabaseisquickandefficientforthe administrator.Asthedatabasehasthepotentialtobecomehuge,thereisasearchfeatureforevery tableincludingstudent,teacheretc.Thesearchhasgetaspecificrecordbasedonnameorid.Also,it can filter the record based on department, classetc.

Figure3.19showsthehomepagefortheadmin,itlistsallthedifferenttablesinthedatabase. Figure3.20showsthedetailsoftheclasstable.Eachclassconsistsofalistofstudentsasshown.

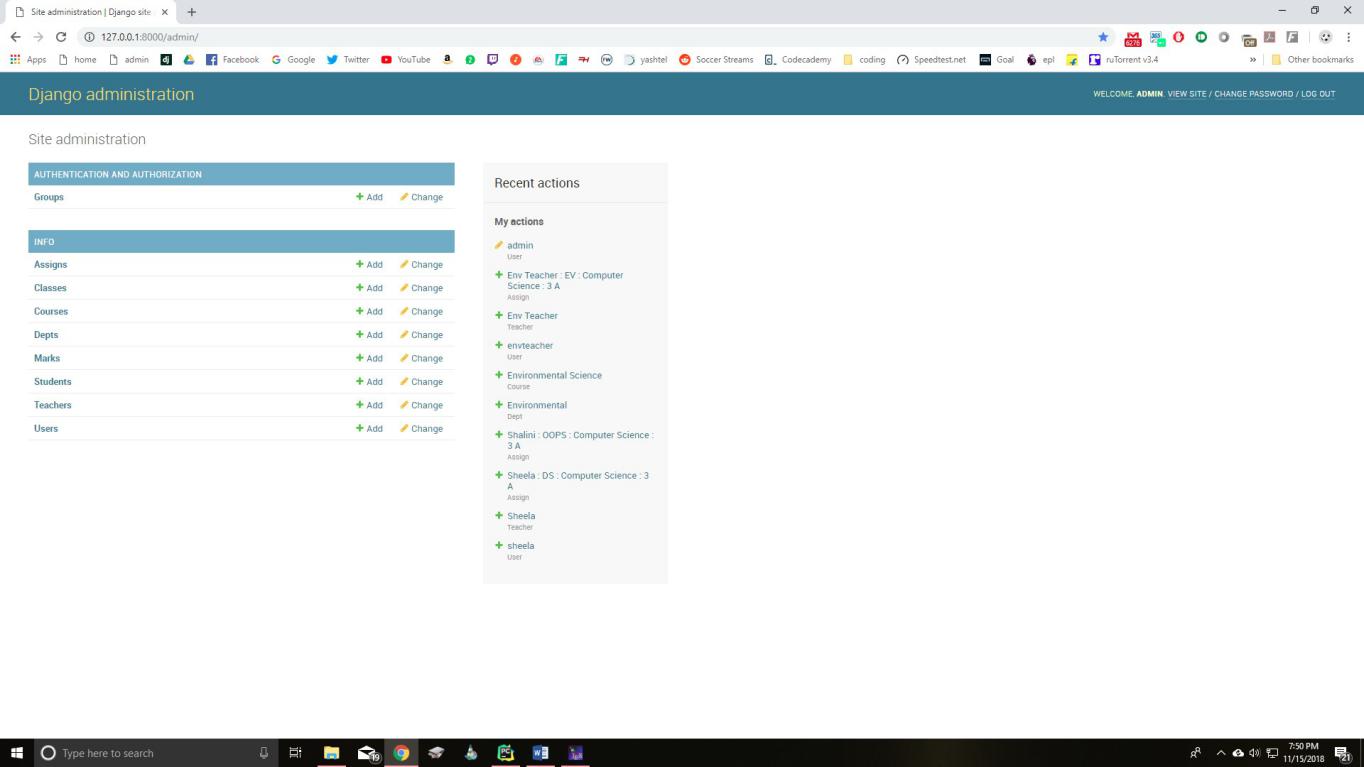


Figure 4.19: Admin homepage

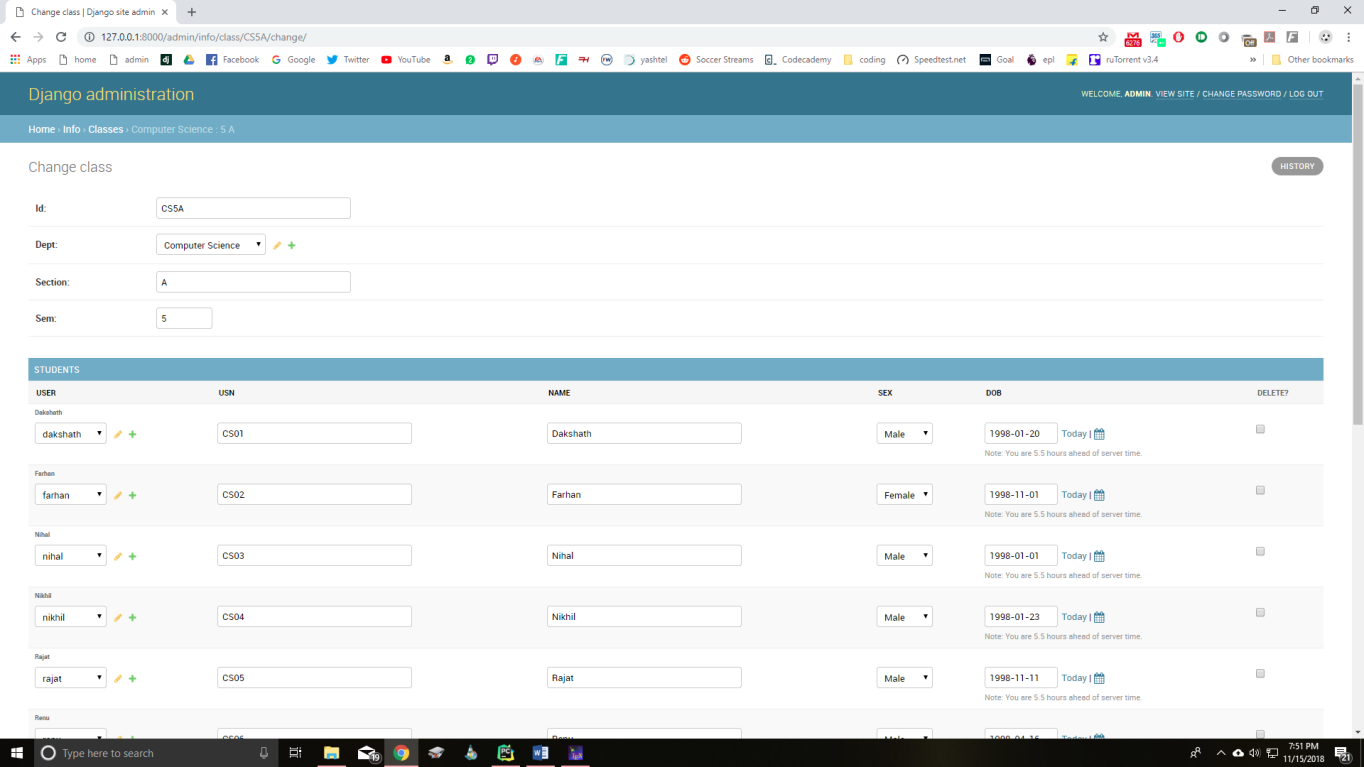
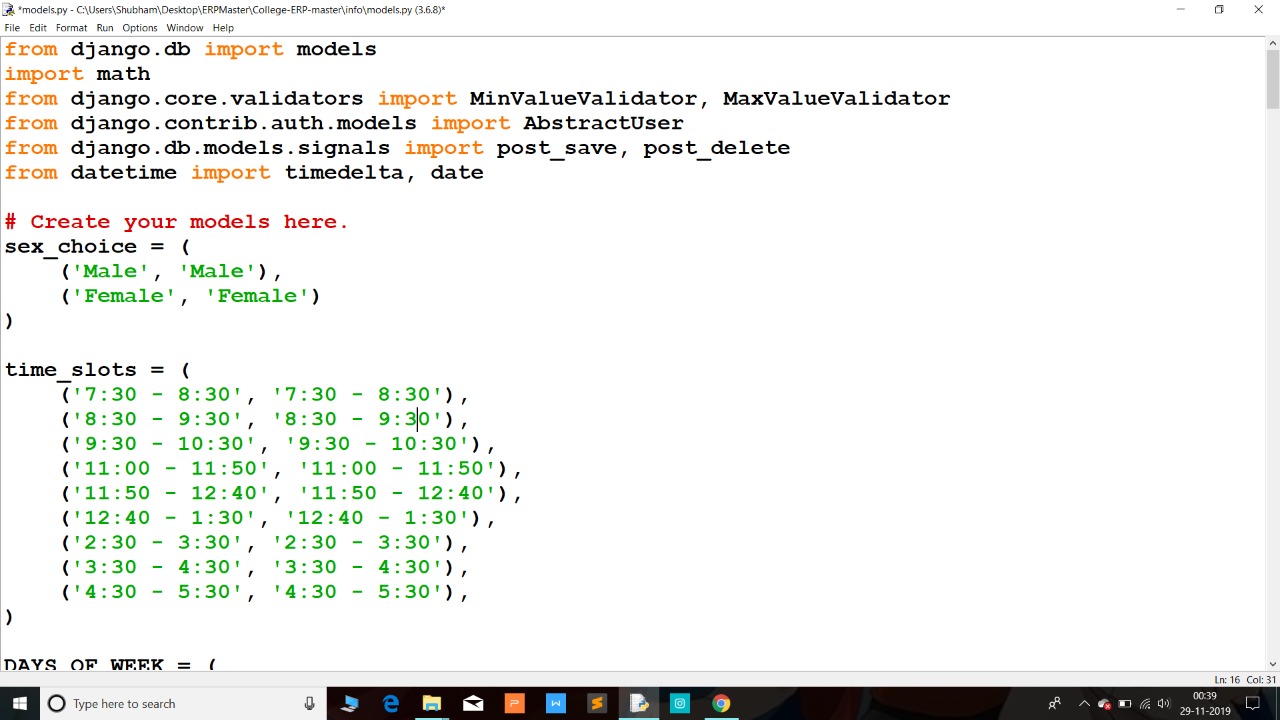
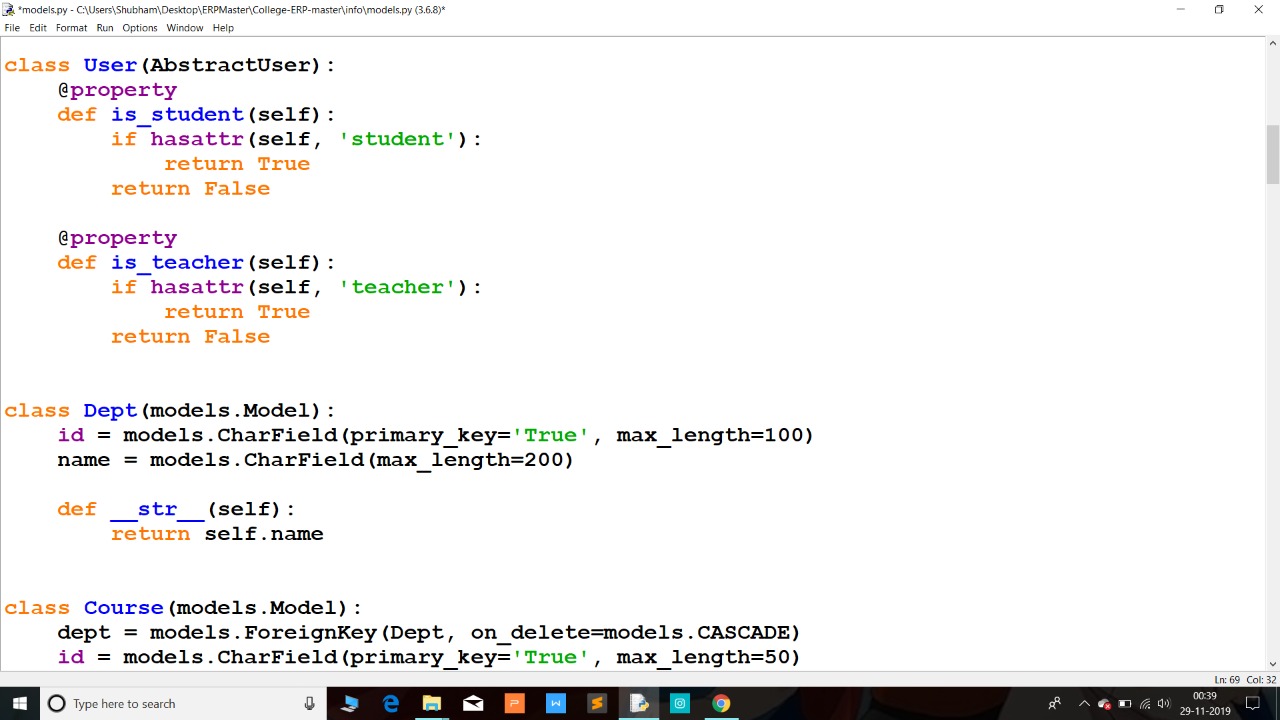
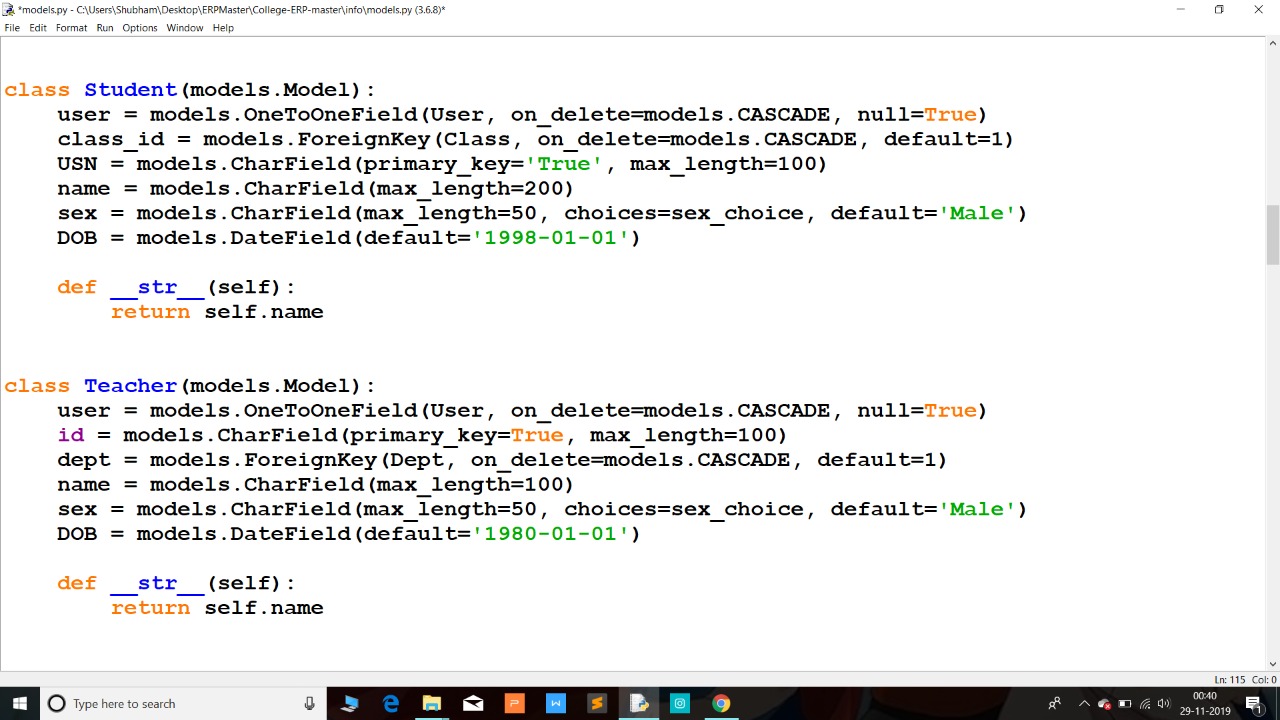


Figure 4.20: Admin students table page

4.21 Code for project

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## Chapter 5

**System Testing and results analysis**

Thecompletionofasystemwillbeachievedonlyafterithasbeenthoroughlytested.Thoughthisgives afeeltheprojectiscompleted,therecannotbeanyprojectwithoutgoingthroughthisstage.Hencein thisstageitisdecidedwhethertheprojectcanundergotherealtimeenvironmentexecutionwithout anybreakdowns,thereforeapackagecanberejectedevenatthisstage.

### Testingmethods

Softwaretestingmethodsaretraditionallydividedintoblackboxtestingandwhiteboxtesting.These twoapproachesareusedtodescribethepointofviewthatatestengineertakeswhendesigningtest cases.

#### White BoxTesting

Whiteboxtesting,bycontrasttoblackboxtesting,iswhenthetesterhasaccesstotheinternaldata structuresandalgorithms(andthecodethatimplementthese).Whiteboxtestingmethodscanalsobe usedtoevaluatethecompletenessofatestsuitethatwascreatedwithblackboxtestingmethods.This allowsthesoftwareteamtoexaminepartsofasystemthatarerarelytestedandensuresthatthemost important function points have beentested.

ThisprojectisimplementedusingpythonwiththeDjangoframework.Thecodeconsistsofmodels andviewswhichcanbetested.ModelsdefinethetablesstoredinSQLandtherelationshipbetween thedifferenttablesusingforeignkeys.Aviewfunction,or“view”forshort,issimplyaPythonfunction thattakesawebrequestandreturnsawebresponse.ThisresponsecanbetheHTMLcontentsofa Webpage,oraredirect,ora404error,oranXMLdocument,oranimage,etc.

Pythonalsoprovidesafilecalledtest.pywherewecanwriteunittestsforthemodelsandviews. Thisisveryusefulasitautomatesthetestingandwenolongerhavetomanuallytesteverypageafter therewereanychanges.Thepythoncodeispastedbelowandeachtestisexplainedusingcommentsin thecode.

from django.test import TestCase

from info.models import Dept, Class, Course, User, Student, Teacher, Assign, Attendance from django.urls import reverse

from django.test.client import Client

class InfoTest(TestCase):

# function used to create test users

def create\_user(self, username=’testuser’, password=’project123’): self.client = Client()

return User.objects.create(username=username, password=password)

# test to check whether an object in the user table is created without errors deftest\_user\_creation(self):

us = self.create\_user()

ut = self.create\_user(username=’teacher’)

s = Student(user=us, USN=’CS01’,name=’test’) s.save()

t=Teacher(user=ut,id=’CS01’,name=’test’) t.save()

self.assertTrue(isinstance(us, User)) self.assertEqual(us.is\_student, hasattr(us, ’student’)) self.assertEqual(ut.is\_teacher, hasattr(ut, ’teacher’))

# function used to create test users

def create\_dept(self, id=’CS’, name=’CS’):

return Dept.objects.create(id=id, name=name)

# test to check whether an object in the user table is created without errors deftest\_dept\_creation(self):

d = self.create\_dept() self.assertTrue(isinstance(d, Dept)) self.assertEqual(d.str(),d.name)

#functionusedtocreatetestclass

def create\_class(self, id=’CS5A’, sem=5, section=’A’):

dept = self.create\_dept()

return Class.objects.create(id=id, dept=dept, sem=sem, section=section)

# test to check whether an object in the class table is created without errors deftest\_class\_creation(self):

c = self.create\_class() self.assertTrue(isinstance(c, Class))

self.assertEqual(c.str(), "s : d s"(c.dept.name, c.sem,c.section))

# function used to create test course

def create\_course(self, id=’CS510’, name=’Data Struct’, shortname=’DS’): dept = self.create\_dept(id=’CS2’)

return Course.objects.create(id=id, dept=dept, name=name, shortname=shortname)

# test to check whether an object in the course table is created without errors deftest\_course\_creation(self):

c = self.create\_course() self.assertTrue(isinstance(c, Course)) self.assertEqual(c.str(), c.name)

# function used to create test student

def create\_student(self, usn=’CS01’, name=’samarth’): cl = self.create\_class()

u = self.create\_user()

return Student.objects.create(user=u, class\_id=cl, USN=usn, name=name)

# test to check whether an object in the student table is created without errors deftest\_student\_creation(self):

s = self.create\_student() self.assertTrue(isinstance(s, Student)) self.assertEqual(s.str(), s.name)

# function used to create test teacher

def create\_teacher(self, id=’CS01’, name=’teacher’):

dept = self.create\_dept(id=’CS3’)

return Teacher.objects.create(id=id, name=name, dept=dept)

# test to check whether an object in the teacher table is created without errors deftest\_teacher\_creation(self):

s = self.create\_teacher() self.assertTrue(isinstance(s, Teacher)) self.assertEqual(s.str(), s.name)

# function used to create test assign def create\_assign(self):

cl = self.create\_class() cr = self.create\_course() t =self.create\_teacher()

return Assign.objects.create(class\_id=cl, course=cr, teacher=t)

# test to check whether an object in the assign table is created without errors deftest\_assign\_creation(self):

a = self.create\_assign() self.assertTrue(isinstance(a, Assign))

# views

# setup a test user so that login is possible def setUp(self):

self.client = Client()

self.user = User.objects.create\_user(’test\_user’, [’test@test.com’,](mailto:test@test.com) ’test\_password’)

# test to ensure admin doesn’t have access to student ot teacher page def test\_index\_admin(self):

self.client.login(username=’test\_user’, password=’test\_password’) response = self.client.get(reverse(’index’)) self.assertContains(response, "you have been logged out") self.assertEqual(response.status\_code,200)

# test to ensure student can access only the student page def test\_index\_student(self):

self.client.login(username=’test\_user’, password=’test\_password’)

s = Student.objects.create(user=User.objects.first(), USN=’test’, name=’test\_name’) response = self.client.get(reverse(’index’))

self.assertContains(response, s.name) self.assertEqual(response.status\_code, 200)

test to ensure teacher can access only the teacher page def test\_index\_teacher(self):

self.client.login(username=’test\_user’, password=’test\_password’)

s = Teacher.objects.create(user=User.objects.first(), id=’test’, name=’test\_name’) response = self.client.get(reverse(’index’))

self.assertContains(response, s.name) self.assertEqual(response.status\_code, 200)

# test for response "student has no courses" in the website # when student hasn’t been assigned any course

def test\_no\_attendance(self):

s = self.create\_student()

self.client.login(username=’test\_user’, password=’test\_password’) response = self.client.get(reverse(’attendance’, args=(s.USN,))) self.assertContains(response, "student has no courses") self.assertEqual(response.status\_code,200)

# test which assigns student a course and tests whether the attendance for the #sameisdisplayedonthewebste

def test\_attendance\_view(self):

s = self.create\_student()

self.client.login(username=’test\_user’, password=’test\_password’) Assign.objects.create(class\_id=s.class\_id, course=self.create\_course(), teacher=self.create\_teacher())

response = self.client.get(reverse(’attendance’, args=(s.USN,))) self.assertEqual(response.status\_code, 200) self.assertQuerysetEqual(response.context[’att\_list’], [’<AttendanceTotal: AttendanceTotal object (1)>’])

# test for response "student has no attendance" on the attendance detail page #whenteacherhasn’tmarkedanyattendanceforthatcourseyet.

def test\_no\_attendancedetail(self):

s = self.create\_student() cr = self.create\_course()

self.client.login(username=’test\_user’, password=’test\_password’)

resp = self.client.get(reverse(’attendance\_detail’, args=(s.USN, cr.id))) self.assertEqual(resp.status\_code, 200)

self.assertContains(resp, "student has no attendance")

# test which marks one attendance for the student and course and tests whether # it is displayed properly in the attendance detail page.

def test\_attendancedetail(self):

s = self.create\_student() cr = self.create\_course()

Attendance.objects.create(student=s, course=cr) self.client.login(username=’test\_user’, password=’test\_password’)

resp = self.client.get(reverse(’attendance\_detail’, args=(s.USN, cr.id))) self.assertEqual(resp.status\_code, 200) self.assertQuerysetEqual(resp.context[’att\_list’],

[’<Attendance: ’ + s.name + ’ : ’ + cr.shortname + ’>’])

##### Result of Testing

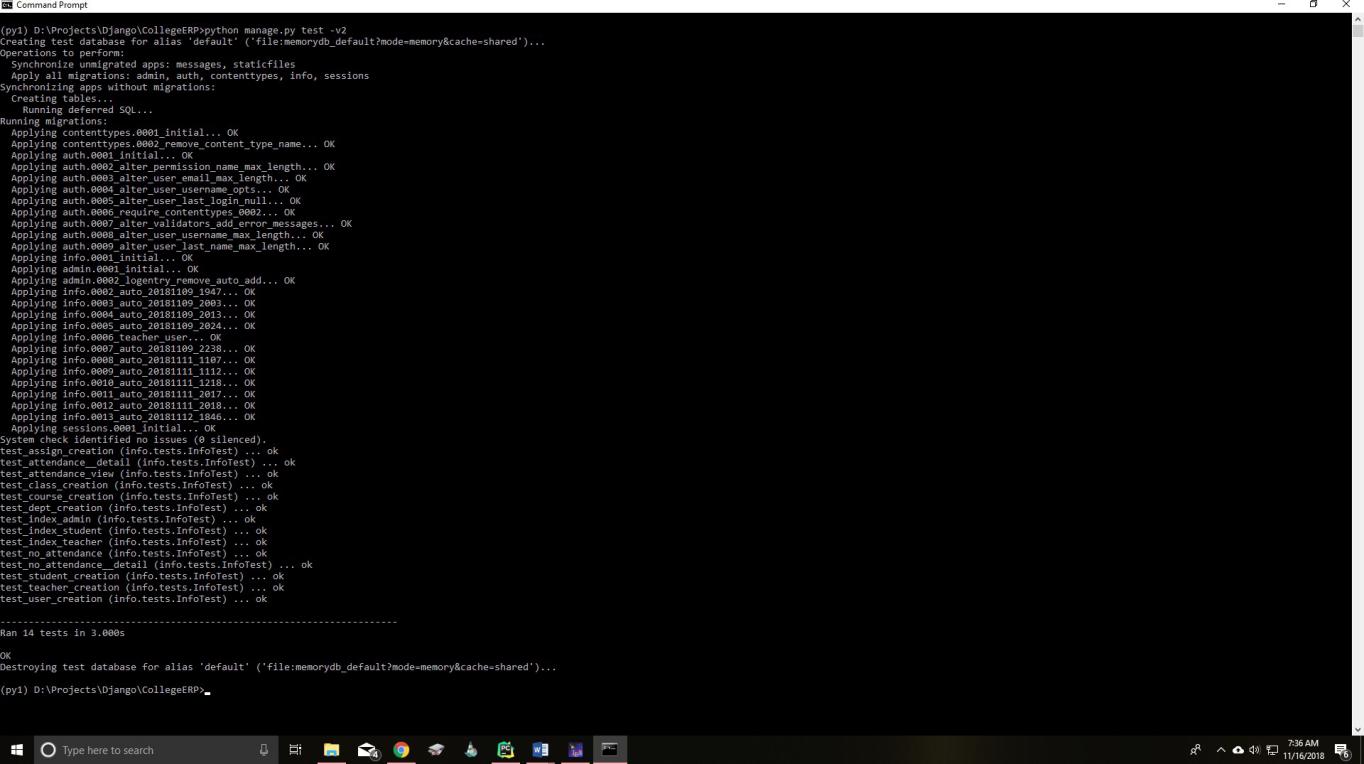


Figure 5.1: Testing results

#### Black BoxTesting

Blackboxtestingtreatsthesoftwareasa”blackbox,”withoutanyknowledgeofinternalimplementation. Blackboxtestingmethodsinclude:equivalencepartitioning,boundaryvalueanalysis,all-pairstesting, fuzztesting,model-basedtesting,traceabilitymatrix,exploratorytestingandspecification-basedtesting.

Weperformedblackboxtestingontheteacherpagetomakesureeverypagewasworkingasdesired. Wetookintoconsiderationvarioustestcasesandnoteddowntheresults.Belowwehaverecorded various test cases and their respectiveresults

##### Test Case: 1

**Request the attendance page for a teacher with no assigned classes.**

The web page loaded with message ”Teacher has no classes assigned”.

##### Test Case: 2

**Request the attendance page for a teacher with 1 assigned class.**

Thewebpagedisplayedtheassignedclassandoptionstoenterattendanceandviewthestudents

##### Test Case: 3

**Request to enter the attendance for an assigned class with one test student**

Thewebpagedisplaysthestudentwithhis/herdetailsandanoptionstomarkpresentorabsent. On marking absent, it can beviewed by the student.

##### Test Case: 4

**Request to edit the attendance for an assigned class with one test student**

Thestudentislistedwithhis/herdetailsandisinitiallymarkedasabsentfromtheprevioustest. Onmarkingpresent,theattendanceforthatstudentandcanbeviewedbythestudent.

##### Test Case: 5

**Request to enter the marks for an assigned class with one student**

Initially,alistoftestsisdisplayssuchasinternals1,SEEetc.Onselectingoneofinternals1,the teachercanenterthemarksforthestudentoutof20.Onsubmitting,thestatusforthattestturns green denoting that it has been successfullyentered.

##### Test Case: 6

**Request to edit the marks for an assigned class with one student**

Foreachclass,thereisalistoftestssuchasinternals1,SEEetc.Asthemarksforinternals1was alreadyenteredintheprevioustest,itismarkedgreenandthereisanoptiontoedit.Whenediting, themarksalreadystoredisdisplayedandappropriatechangescanbemadeandsaved.

##### Test Case: 7

**Request to view the student information for an assigned class with no students**

Therequestedpageisdisplaywithnocontentandamessagestating”Thisclasshasnostudentsassigned”

##### Test Case: 8

**Request to view the student information for an assigned class with 1 student**

Thewebpageistheformofatablewithentriesforstudentname,USNandtheirattendanceper- centage,marksineachtestincluding3internals,2eventsand1SEE.IFtheattendancestatusisbelow 75%, it is marked inred.

#### AcceptanceTesting

Acceptancetestingperformedbythecustomerisknownasuseracceptancetesting(UAT).

Sinceourprojectisoncollegemanagementsystem,theteachersareakeystakeholder.Hence,itwas importanttoallowtheteacherstotestthesoftwareandgettheirapprovalastheyintendtousethe softwarethemost.Therefore,wemetandagaveademonstrationoftheprojecttoourteacherDr. TrisiladeviC.Nagavi.Weshowedherallthefeaturesandfunctionalityofthewebsite.Shewent throughallthedifferentwebpagesandaskedseveralquestionsontheworkingofthecode.

Overall she was happy with the working and results of the software.

### Results of testing

Afterapplyingvarioustestingmethodssuchasblackboxtesting,whiteboxtestingandacceptance testing,Wecanconcludethatthetestingforthesoftwareiscompleted.Tosummarizethetestingphase, whiteboxtestingisdoneusingtheinbuiltfeatureofDjangotoapplyunitteststoallthecomponentsin thesoftware.Afteranychangestothesoftware,wecanrunthetestsonthesoftwareautomaticallyand thuswecanfindandeliminateanybugsorerrorsinthesystemeasilyinsteadofperformingrigorous manual testing after everychange.

Inblackboxtesting,wetestingallthecomponentsandsystemasawhole.Severaltestcaseswere consideredandextensivetestswereconducted.Theresultsofthesetestswerepositiveandanyerrors were fixed during the testingphase.

Foracceptancetesting,wegaveademonstrationofthesoftwaretoourteacher,whoisakeystake- holder.Afterseveraltestsandquestions,shewascontentwithresultsofthetestsandsoftware.

## Chapter 6

**Conclusion**

### Conclusion

ByusingExistingSystemaccessinginformationfromfilesisadifficulttaskandthereisnoquickand easywaytokeeptherecordsofstudentsandstaff.LackofautomationisalsothereintheExisting System.TheaimofOurSystemistoreducetheworkloadandtosavesignificantstafftime.

TittleoftheprojectasCollegeERPSystemisthesystemthatdealswiththeissuesrelatedtoa particularinstitution.Itistheveryusefultothestudentaswellasthefacultiestoeasyaccesstofinding thedetails.ThecollegeERPprovidesappropriateinformationtousersbasedontheirprofilesandrole inthesystem.Thisprojectisdesignedkeepinginviewthedaytodayproblemsfacedbyacollegesystem.

Thefundamentalprobleminmaintainingandmanagingtheworkbytheadministratorishenceover- come.Priortothisitwasabitdifficultformaintainingthetimetableandalsokeepingtrackofthedaily schedule.Butbydevelopingthisweb-basedapplicationtheadministratorcanenjoythetask,doingit easeandalsobysavingthevaluabletime.Theamountoftimeconsumptionisreducedandalsothe manualcalculationsareomitted,thereportscanbeobtainedregularlyandalsowheneverondemand bytheuser.Theeffectiveutilizationofthework,bypropersharingitandbyprovidingtheaccurate results.Thestoragefacilitywilleasethejoboftheoperator.Thusthesystemdevelopedwillbehelpful to the administrator by easing his/hertask.

ThisSystemprovidetheautomateadmissionsnomanualprocessingisrequired.Thisisapaperless work.Itcanbemonitoredandcontrolledremotely.Itreducesthemanpowerrequired.Itprovides accurateinformationalways..Allyearstogethergatheredinformationcanbesavedandcanbeaccessed atanytime.Thedatawhichisstoredintherepositoryhelpsintakingintelligentdecisionsbythe managementprovidingtheaccurateresults.Thestoragefacilitywilleasethejoboftheoperator.Thus thesystemdevelopedwillbehelpfultotheadministratorbyeasinghis/hertaskprovidingtheaccurate results.Thestoragefacilitywilleasethejoboftheoperator.

Thisprojectissuccessfullyimplementedwithallthefeaturesandmodulesofthecollegemanagement system as perrequirements.

**7 . FUTURE SCOPE**

The educational system around the world is undergoing a tremendous change in the area of knowledge and strategy. In general, the curriculum practices have revolutionized by the academicians and educational administrators. The learners have also demanded varied types of knowledge and skills required for their day-to-day activity. Nature and the forms of educational system should accommodate the requirement of the nation and society in general individual learner in particular. The traditional classroom approaches requires a tremendous change in the way of delivery and knowledge transmission for the development of cognitive and non-cognitive areas of learning with emphasize on qualities of personal and social growth. The education commissions and committees have also recommended and stressed that education should be made both universally available and more relevant. In this context this paper suggests a learner-centered approach for the demands of the nation and the society at large. The learner-centered approach suggested by this paper, a Virtual Classroom (VC) approach is a stress on its architecture, facilities, interactivity and network. Based on the criteria the authors have developed three models of VC approach and future benefits of these approaches for knowledge management system for effective acquisition, sharing, utilization and creation of knowledge in the area of teaching-learning process.

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