

Florida International University
School of Computing and Information Sciences

Software Engineering Focus

Final Deliverable

Learning Management System on Facebook v3.0

Team Members: Joao Guimaraes, Daniel Rodriguez

Product Owner: Dr. Alejandro Arrieta

Instructor: Masoud Sadjadi

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Abstract

Dr. Alejandro Arrieta wanted to continue to leverage the powerful Facebook infrastructure, to teach students from countries with stringent and expensive internet connectivity, through a web application that would give him many more features and control over the design of courses than his Facebook Group. This document describes this web application solution in details, including system design, UML diagrams, and Agile Ceremonies.

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INTRODUCTION

Although access to the internet is becoming more wide spread and internet speed is increasing exponentially every day, the size of the information passing through the internet is also getting larger. The arms race between data-size and internet speed is problematic, especially for individuals in countries with poor internet connection. This is a specifically prevalent issue for individuals who are trying to expand their knowledge and international students who want to engage with an online course effectively and efficiently. In our project, we attempted to help remediate this problem. To do this we built an entirely new system that uses Facebook only as an intermediary for logging in, and built a standalone application using the most recent technologies.

Current System

Our predecessors used an outdated tech-stack which performed sub-optimally and would continue to do so as time went on. They also assumed that using Facebook would mean lower data-usage, however that is not the case unless the data would not be the case unless information was stored on Facebook servers. Nonetheless, Facebook has since made the implementation of this sort of application, a Learning-Management System, nearly impossible. They also separated the separated the instructor front-end from the student front-end, nearly doubling the amount of code to write for each feature. We re-constructed the entire project using a FEAN stack with, or Firebase, Express, Angular 8, and NodeJs.

Purpose of New System

The purpose of the new system is to lay the groundwork for an application that will hold value as time moves forward. We rebuild the application from scratch, substituted all of the older technologies for newer ones, made more efficient use of Facebook login/authentication, and replaced a PostgreSQL database with a Cloud based NoSQL database owned by Google.

By doing this, we hope that we should have a complete product sooner that is easier to maintain and fast to improve upon.

USER STORIES

The following section provides the detailed user stories that were implemented in this iteration of the project. These user stories served as the basis for the implementation of the project's features. This section also shows the user stories that are to be considered for future development.

Implemented User Stories

Assigned to:	Danny Rodriguez - Dashboard Page
User Story:	As a user I want to have relevant information presented to me when I log in so that I can easily access whatever I am looking for.
Acceptance Criteria: <ul style="list-style-type: none"> - Displays currently active courses - Displays course attributes 	

Assigned to:	Danny Rodriguez - Database Configuration
User Story:	As a developer, I would like to be able to reference and use the data in the database.
Acceptance Criteria: <ul style="list-style-type: none"> - Initialize DB to work when building and running app locally 	

Assigned to:	Danny Rodriguez - Login Page
User Story:	As a user, I would like to log in so that I can see all of the classes I am currently registered in.
Acceptance Criteria: <ul style="list-style-type: none"> - Log in with Facebook information 	

- Specify authorizations

Assigned to:	Danny Rodriguez - Home Page
User Story:	As a user, I want the first page I see to have an about us as well as instructions on how to use the website so that I can begin navigating the app.
Acceptance Criteria: <ul style="list-style-type: none"> - Contain an about us section - Contain a text box that will eventually contain instructions on navigating the app - Accessible thru the nav bar - Formatted properly using angular materials 	

Assigned to:	Danny Rodriguez - Help Page
User Story:	As a user, I would like to be able to contact customer/user support via an easily accessible and visible Help page, for any issues or bugs that I run into.
Acceptance Criteria: <ul style="list-style-type: none"> - Easily accessible via all other pages - Contains contact information - Allows user to report a problem through a text box submission 	

Assigned to:	Danny Rodriguez – New Course Page/Dialog
User Story:	As a Instructor/Admin I need to be able to create add new courses to the LMS.

Acceptance Criteria:

- Must have course name, description, category, instructor's id, instructor's name, maximum number of students, and is it is open.
- Must have title input, category input, instructor id input, description input, and input validation

Assigned to:	Danny Rodriguez – Roll Call Page
User Story:	As an instructor, I would like to see a list of all the names and emails of the students currently enrolled in a given course.
Acceptance Criteria: <ul style="list-style-type: none"> - Present list of all students in a given course - Visible to instructor only - Contains contact information for each student 	

Assigned to:	Danny Rodriguez - Publish to Facebook
User Story:	As a user, I would like to access the app via Facebook.
Acceptance Criteria: <ul style="list-style-type: none"> - Publish app to Facebook - Work with backend 	

Assigned to:	Danny Rodriguez - Videos Page
User Story:	As a student, I would like to be able to watch video lectures within the app itself.
Acceptance Criteria: <ul style="list-style-type: none"> - Have playable media on page for a course - Play and pause on click 	

Assigned to:	Danny Rodriguez - Communication's Channel Page
User Story:	As a user, I would like to be able to have a means of communication for anyone associated to the course.
Acceptance Criteria: <ul style="list-style-type: none">- Send and Receive messages- Reply, forward, and copy messages- Accessible to users from a specific course dashboard	

Assigned to:	Danny Rodriguez - Authentication with Facebook
User Story:	As a user, I would like to be able to login with Facebook and allow the application to use relevant personal information such as my name and email so that I can access my courses.
Acceptance Criteria: <ul style="list-style-type: none">- Save user information in backend from a frontend event- Use and apply backend data taken from Facebook to use in authenticating with courses	

Assigned to:	Danny Rodriguez - Profile Page
User Story:	As a user, I would like to be able to visit a profile page, where I could see relevant personal information used by the application.
Acceptance Criteria: <ul style="list-style-type: none">- Accessible via the nav bar- Redirects to a new page	

Assigned to:	Danny Rodriguez - Facebook Login
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User Story:	As a user I want to have relevant information presented to me when I log in so that I can easily access whatever I am looking for.
Acceptance Criteria: <ul style="list-style-type: none"> - Login with Facebook on single click. accessible via the nav bar in account button dropdown - Adds student information to backend 	

Assigned to:	Danny Rodriguez - Inbox Page
User Story:	As a user, I would like to visit a page where I could see all current and past conversations with other students, groups of students, instructors, and TA's, so that I could revisit those conversations.
Acceptance Criteria: <ul style="list-style-type: none"> - Store and list exchanges between users with a title and an association with a course - Visit the conversation to see its contents 	

Assigned to:	Danny Rodriguez - Compose Message Dialog
User Story:	As a user, I would like to be able to message other users in a given course, so that I can have effective private communication with them.
Acceptance Criteria: <ul style="list-style-type: none"> - Send private message to another user - Save and store in Inbox page 	

Assigned to:	Danny Rodriguez - Course Announcements Page
User Story:	As a user, I would like to be able to message other users in a given course, so that I can have effective private communication with them.

Acceptance Criteria:

- Display announcements made by a Professor in a user-friendly and easily visible display

Assigned to:	Danny Rodriguez - Code Refinement**
User Story:	As a user, I would like to navigate the application with ease and without error so that I can have the full experience the application offers.
Acceptance Criteria: <ul style="list-style-type: none"> - Fix bugs and errors - Remove all unnecessary or obsolete code - Refine methods, implementations, etc. 	

Assigned to:	Danny Rodriguez - Facebook Authentication Bugs
Repro Steps:	Checkout to Sprint3BranchDanny Run backend with node index.js in CLI Any attempt to reach 3001 URL results in internal error
Acceptance Criteria <ul style="list-style-type: none"> - Pass token from Facebook into app - Resolve internal error 	

Assigned to:	Danny Rodriguez - Enhance Profile Page
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User Story:	As a student, I would like to be able to edit my profile information, automatically set my profile picture from my Facebook account and access my personal information in a more user friendly design framework.
Acceptance Criteria: <ul style="list-style-type: none"> - Edit student Dialog - Use Facebook Graph API to get profile picture with minimum calls 	

Assigned to:	Danny Rodriguez - Enhance Dashboard Page
User Story:	As a user, I would like to interact with a more user friendly Dashboard page.
Acceptance Criteria: <ul style="list-style-type: none"> - Display 'No Current Courses' when not currently enrolled in a course - Remove Dashboard from NavBar for Instructors (decision reversed) - Redesign Mat-card Layout to fit longer class names 	

Assigned to:	Danny Rodriguez - Enhance Help Page
User Story:	As a user, I would like to see a list of FAQ with answer and have the ability to email a support contact in case I run into any problems or have any questions.
Acceptance Criteria: <ul style="list-style-type: none"> - Display 'No Current Courses' when not currently enrolled in a course - Remove Dashboard from NavBar for Instructors (decision reversed) - Redesign Mat-card Layout to fit longer class names 	

Assigned to:	Danny Rodriguez - Refine NavBar UI
User Story:	As a user, I would like the NavBar to display information relevant to my authorization level (student, instructor, admin), so that I can more easily navigate the application.

Acceptance Criteria:

- Display correct nav bar toolbar for each type of user
- Put profile page in Account dropdown rather

Assigned to:	Danny Rodriguez - Document Developer Setup
User Story:	As a developer, I would like to have documentation with instructions on recreating the project, understanding the folder structure, testing features, accessing the database, and continuing to develop new features.
Acceptance Criteria: <ul style="list-style-type: none"> - Full Length detailed instructions on recreating project - Package installations needed - Video Demonstration 	

Assigned to:	Danny Rodriguez - Enhance Videos Upload/Embed
User Story:	As an instructor, I would like to be able to embed any video type into a module page so that the user doesn't need to open a new URL or be redirected.
Acceptance Criteria: <ul style="list-style-type: none"> - Embed Videos for user use without redirect - Supported for YouTube videos without embed link, just YouTube video watch link needed 	

Assigned to:	Joao Guimaraes - New Discussion Post #82
User Story:	As a user I want to be able to contribute to open discussion with posts of my own courses I have access to.

Acceptance Criteria:

- Submit posts with reasonable size
- Show Date of submission in new post
- Show user's name in new post

Assigned to:	Joao Guimaraes - Discussion Pages #80
User Story:	As a user I need to access course discussion where content relevant to courses I have access will be present, and where I can contribute with my own posts.
Acceptance Criteria: <ul style="list-style-type: none"> - Must have pagination - Must display discussion title - Must display discussion description - Only allow new posts if discussion is currently open 	

Assigned to:	Joao Guimaraes - Navigation Bar #76
User Story:	As a user I want to access important parts of the web application through a “central” navigation bar.
Acceptance Criteria: <ul style="list-style-type: none"> - Button or clickable logo for home / dashboard pages - Button or menu for courses this user has access to - Button or menu for course catalog - Button or menu for account access and functions 	

Assigned to:	Joao Guimaraes - Course Page #78
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User Story:	As a user I want to access a page where I can go to this course's grades, learning materials, assessments, and anything else that is part of this course.
Acceptance Criteria: <ul style="list-style-type: none"> - Must display course name - Must have course syllabus link with description, instructor name and email - Must have link to discussions page - Must have link to Grades page - Must have link to Modules page 	

Assigned to:	Joao Guimaraes - Discussions Page #79
User Story:	As a user I need page from where I can access all course discussions, for courses I have access to.
Acceptance Criteria: <ul style="list-style-type: none"> - Link to all discussion associated with the current course. - Button / link to add new discussion from this page. 	

Assigned to:	Joao Guimaraes - Edit Course Dialog #96
User Story:	As an admin I want to have the ability to edit details about courses.
Acceptance Criteria: <ul style="list-style-type: none"> - Must have title input - Must have instructor input - Must have end of enrollment date input - Must have course description input - Must have input validation 	

Assigned to:	Joao Guimaraes - Add Discussion Dialog #95
User Story:	As an instructor / admin I need to be able to add new discussions to my courses.
Acceptance Criteria: <ul style="list-style-type: none">- Must have discussion title input- Must have ability to add closed or open discussions- Must have end of discussion date input- Must have discussion description input- Must have input validation	

Assigned to:	Joao Guimaraes - Edit Discussion Dialog #96
User Story:	As an instructor / admin I need to be able to edit discussions in my courses.
Acceptance Criteria: <ul style="list-style-type: none">- Must have ability to close or open- Must have the ability to change the date of end of discussion- Must have the ability to change the title of the discussion- Must have ability to edit the description- Must have ability to remove discussion from course- Must have input validation	

Assigned to:	Joao Guimaraes - Add Content Dialog #93
User Story:	As an instructor I need to be able to add new content to modules.
Acceptance Criteria: <ul style="list-style-type: none">- Ability to add external links- Ability to add embedded videos	

- Ability to add quizzes

Assigned to:	Joao Guimaraes - New Module Dialog #91
User Story:	As an instructor I need the ability to add new modules to my courses.
Acceptance Criteria: <ul style="list-style-type: none"> - Input for module title - Input validation 	

Assigned to:	Joao Guimaraes - New Module Dialog #114
User Story:	As an admin I need the ability to login through this web app to access restricted admin / instructor features.
Acceptance Criteria: <ul style="list-style-type: none"> - Encrypted API calls - Require authentication by token to make admin API calls 	

Assigned to:	Joao Guimaraes - Confirm Course Enrollment Page #115
User Story:	As an admin/instructor I need the ability to decide whether to accept a student registration into a course or to remove them from the registered list.
Acceptance Criteria: <ul style="list-style-type: none"> - When user tries to register for a course, backend attempts to insert student in registered list - If class is full (students + registered >= MAX_SIZE), student is inserted into waiting list 	

- Admin/Instructor can choose to either confirm enrollment which moves the student from registered to students list, or remove the student completely from the list, in which case a student if any is moved from the waiting list to the registered list
- Confirm course enrollment page, displays list of registered students
- On attempting to remove a student a dialog will ask to confirm
- The page also displays the number of students in waiting

Assigned to:	Joao Guimaraes - Basic Multiple Choice Assessment Page #113
User Story:	As an instructor I need the ability to add quizzes to my courses to gauge student performance in courses.
Acceptance Criteria: <ul style="list-style-type: none"> - Must display quiz title - Students can submit quiz for grade at any point during the assessment - Attempt to save individual answers - Able to return to quiz in case of disconnect - If quiz is already due when page is loaded submit immediately 	

Assigned to:	Joao Guimaraes - Basic Multiple Choice Assessment Page #118
User Story:	As an admin I want to add other admin / Instructor users to the application.
Acceptance Criteria: <ul style="list-style-type: none"> - Must have name input - Must have primary email input for logging in - Must have secondary email input for student communication - Must have password input - Must have password confirmation input - Must have authorization level input - Must have input validation 	

Assigned to:	Joao Guimaraes - User Dependent Navigation #119
User Story:	As a user I want to only have access to relevant features, and that my courses are protected from unauthorized changes.
Acceptance Criteria: <ul style="list-style-type: none">- Students are only allowed to access student pages- Hide admin functions from student users	

Assigned to:	Joao Guimaraes - User Dependent Navigation #116
User Story:	As an instructor I need students to register as students in this application to get accurate and additional information from students.
Acceptance Criteria: <ul style="list-style-type: none">- Require name- Require phone number- Require email- Require Country- Require input validation	

Assigned to:	Joao Guimaraes - Courses Catalog with Pagination #123
User Story:	As a user I want to be able to browse all courses in the course catalog with pagination.
Acceptance Criteria: <ul style="list-style-type: none">- Must display course title, enrollment deadline, instructor name, number of open spots, course description- Must have button to register for course- Disable registration button if admin or course is not open- Add notifications in response to attempting to register for a course	

Assigned to:	Joao Guimaraes - User Course Enrollment #126
User Story:	As a student I need the ability to register for a course from any page in the courses browsing page.
Acceptance Criteria: <ul style="list-style-type: none"> - Add functionality to registration button - If course is full, give the option to attempt to register and be placed in waiting list - If the student is already enrolled in a course, remind them of that fact 	

Assigned to:	Joao Guimaraes - Browse Catalog by Category #124
User Story:	As a student I want to narrow down my searching by browsing courses by category.
Acceptance Criteria: <ul style="list-style-type: none"> - Dropdown list of categories to select category 	

Assigned to:	Joao Guimaraes - Remove Course Module #131
User Story:	As an Instructor or admin I want the ability to remove course modules from my courses.
Acceptance Criteria: <ul style="list-style-type: none"> - Add link / button to remove module - Require confirmation to remove the module once button is clicked 	

Assigned to:	Joao Guimaraes - Admin Actions Logging #132
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User Story:	As an admin I want the ability to check check any administrative actions performed such as content creation and removal, to be able to remedy mistakes.
Acceptance Criteria: <ul style="list-style-type: none"> - Add a logs page to display logs by date - Store user id, method called, parameters, result, time, and description when administrative API call is made. 	

Assigned to:	Joao Guimaraes - Manage Courses Page #134
User Story:	As an admin/ instructor I need to have a way to easily access the courses I manage.
Acceptance Criteria: <ul style="list-style-type: none"> - If Instructor only give access to courses this instructor teaches - If admin give access to all courses 	

Assigned to:	Joao Guimaraes - Catalog Course Searching #125
User Story:	As a user I want the ability to search for courses by typing course names to quickly access courses I am already aware of.
Acceptance Criteria: <ul style="list-style-type: none"> - Add text input to type search strings - Must have search prediction - On search display only courses that start with the search string 	

Assigned to:	Joao Guimaraes - Get Percent Method Bug #133
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User Story:	Method currently uses generic algorithm to calculate percentages and does not work well with missing data. Returning wrong results.
Acceptance Criteria:	
<ul style="list-style-type: none"> - Only count assignments that are past due date or already graded - Deal with blank values properly 	

Assigned to:	Joao Guimaraes - Game Currency #141
User Story:	As an instructor I want to incentivize process for students in my courses with some method of recompense for completing quizzes, or other activities within the course.
Acceptance Criteria:	
<ul style="list-style-type: none"> - Add ability add coins through internal backend method - Add coins option in quiz creation 	

Assigned to:	Joao Guimaraes - Catalog Sorting Options #140
User Story:	As a user I want to further narrow down my searching by having the ability to exclude closed courses, and sort by course name, category, or enrollment deadline.
Acceptance Criteria:	
<ul style="list-style-type: none"> - Add dropdown menu to browsing page - Add toggle to remove closed courses. 	

Assigned to:	Joao Guimaraes - Course Sequence #92
User Story:	As a user I want to access course materials in a way that clearly illustrates my progression, which further encourages me to continue.

Acceptance Criteria:

- Display course materials linearly with a pleasant visual interface

Assigned to:	Joao Guimaraes - Gamified Practice Quizzes #139
User Story:	As an instructor I want the ability to add optional practice quizzes in order to cement information just learned.
Acceptance Criteria: <ul style="list-style-type: none"> - If user gets more than 2 questions wrong, end quiz and display result - On answer submission, show correct answer - Add option to create practice quizzes in content creation dialog 	

Pending User Stories

As an admin I want to be able to track whether students have paid their fee to access a course.

As an admin I want to filter students who are or are not eligible for enrollment confirmation to speed up this manual process.

PROJECT PLAN

This section describes the planning that went into the realization of this project. This project incorporated the agile development techniques and as such required the sprints to be planned. These sprint plannings are detailed in the section. This section also describes the components, both software and hardware, chosen for this project.

Hardware and Software Resources

The following is a list of all hardware and software resources that were used in this project:

- **NodeJs**
 - <https://nodejs.org/en/>
- **NodeJs Modules**
 - **Angular CLI**
 - “npm install -g @angular/cli”
 - “@hapi/boom”
 - “bcrypt”
 - “body-parser”
 - “express”
 - “Firebase-admin”
 - “Helmet”
 - “Https”
 - “Jsonwebtoken”
 - “Passport”
 - “passport-facebook-token”
 - “Passport-jwt”
 - “Passport-local”
 - “Jwt-decode”
 - “@kolkov/angular-editor”
 - “ngx-cookie-service”
 - **Angular Material**
 - “ng add @angular/material”
- **Firebase Admin json key**
- **Facebook App Id**

Sprint Plans

Sprint 1

Start:	6:00 PM
End:	6:50 PM

Attendees:	Joao Guimaraes, Danny Rene Rodriguez
Sprint Goal:	The goal of the first sprint is to rebuild the application using updated software resources and create a prototype to work on for the rest of the semester.

Sprint Backlog			
ID	Story Title	Assigned To	Estimate
76	Navigation Bar	Joao Guimaraes	4
78	Course Page	Joao Guimaraes	10
80	Discussion Page	Joao Guimaraes	6
82	New Discussion Post	Joao Guimaraes	6
84	Database Configuration	Daniel Rodriguez	4
77	Dashboard Page	Daniel Rodriguez	6
85	Log in Page	Daniel Rodriguez	10
86	Help/Support Page	Daniel Rodriguez	6
87	Home Page	Daniel Rodriguez	5
88	Hosting Web App	Daniel Rodriguez	6

Sprint Velocity Estimate: 63 points

Sprint 2

Start:	7:35 PM
End:	8:50 PM
Attendees:	Joao Guimaraes, Danny Rene Rodriguez
Sprint Goal:	In this sprint we plan on taking the skeleton for the application we built, using the information we got from the PO, and starting the build out new and efficient features for our application.

Sprint Backlog			
ID	Story Title	Assigned To	Estimate
97	Roll Call Page	Danny Rodriguez	4
98	Publish to Facebook	Danny Rodriguez	4
99	Videos Page	Danny Rodriguez	6
100	Communication Channel Page	Danny Rodriguez	8
83	New Course Page/ Dialog	Danny Rodriguez	4
96	Edit Course Dialog	Joao Guimaraes	4
95	Add Discussion Dialog	Joao Guimaraes	4
94	Edit Discussion Dialog	Joao Guimaraes	4
93	Add Content Dialog	Joao Guimaraes	6
91	New Module Dialog	Joao Guimaraes	4

Sprint Velocity Estimate: 48***Sprint 3***

Start:	9:00 PM
End:	10:30 PM
Attendees:	Joao Guimaraes, Danny Rene Rodriguez
Sprint Goal:	The goal of the third sprint is to deploy the app to a public URL that we can demonstrate feature functionality and the business value of the product as we continue to development and feature implementation.

Sprint Backlog			
ID	Story Title	Assigned To	Estimate
115	Confirm Course Enrollment Page	Joao Guimaraes	4
114	Admin/Instructor Login	Joao Guimaraes	6
113	Multiple Choice Assessment Page	Joao Guimaraes	6
116	Student Account	Joao Guimaraes	6
100	Communications Channel Page	Danny Rodriguez	8
98	Publish to Facebook	Danny Rodriguez	4
99	Videos Page	Danny Rodriguez	6

Sprint Velocity Estimate: 40***Sprint 4***

Start:	9:00 PM
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End:	10:30 PM
Attendees:	Joao Guimaraes, Danny Rene Rodriguez
Sprint Goal:	The goal of the third sprint is to implement new and intriguing features that will be available, secure, and lay the groundwork for our final product to be passed onto the next team.

Sprint Backlog			
ID	Story Title	Assigned To	Estimate
118	Admin/Instructor registration	Joao Guimaraes	4
119	User dependent navigation	Joao Guimaraes	4
123	Courses Catalog with Pagination	Joao Guimaraes	4
116	Student Account	Joao Guimaraes	6
124	Browse Catalog by Category	Joao Guimaraes	4
126	User Course Enrollment	Joao Guimaraes	4
100	Communications Channel Page	Danny Rodriguez	4
122	Authenticate with Facebook	Danny Rodriguez	10
120	Login Page	Danny Rodriguez	8
121	Profile Page	Danny Rodriguez	6

Sprint Velocity Estimate: 54

Sprint 5

Start:	8:18 PM
End:	8:30 PM
Attendees:	Joao Guimaraes, Danny Rene Rodriguez
Sprint Goal:	For this Sprint we plan on adding some features to improve the user experience and ultimately deploy the application for public use.

Sprint Backlog			
ID	Story Title	Assigned To	Estimate
125	Course Searching	Joao Guimaraes	5
132	Admin Actions Logging	Joao Guimaraes	5
131	Remove Course Module	Joao Guimaraes	3
133	Get percent method bug	Joao Guimaraes	3
134	Manage Courses Page	Joao Guimaraes	5
135	Inbox Page	Danny Rodriguez	10
136	Compose Message Dialog	Danny Rodriguez	4
137	Course Announcement Page	Danny Rodriguez	5
138	Code Refinement**	Danny Rodriguez	10

Sprint Velocity Estimate: 50

Sprint 6

Sprint #:	6
Date:	11/20/2019
Start:	9:30 AM
End:	10:00 AM
Attendees:	Joao Guimaraes, Danny Rene Rodriguez
Sprint Goal:	In this Sprint, we plan on enhancing some of our features, consolidating and refining the code to run seamlessly, document the reproduction of our dev environment for the next team and end-to-end testing, as well as record video demonstrations for the next team.

Sprint Backlog			
ID	Story Title	Assigned To	Estimate
142	Enhance Profile Page	Danny Rodriguez	5
143	Enhance Dashboard Page	Danny Rodriguez	5
144	Enhance Help Page	Danny Rodriguez	3
145	Refine NavBar UI	Danny Rodriguez	5
146	Document Developer Setup	Danny Rodriguez	5
147	Enhance Videos Upload/Embed	Danny Rodriguez	5
141	Game Currency	Joao Guimaraes	5
140	Catalog Sorting Options	Joao Guimaraes	5
139	Gamified Practice Quizzes	Joao Guimaraes	7

92	Course Sequence	Joao Guimaraes	8
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Sprint Velocity Estimate: 53

SYSTEM DESIGN

This section contains information on the design decisions that went into this project. The architecture patterns are outlined and explained. The entire system is shown in a package diagram and the subsystems are explained. Finally, the design patterns used in the project are discussed.

Architectural Patterns

3-Tier Architecture

This web application utilizes the 3 Tier Architecture; Tier 1, Presentation Tier, being comprised of all user interface details including the displaying of data, formatting, and requesting data from other tiers. Tier 2, Application Tier, containing all business logic. Tier 3, Data Tier, consists of database servers. These tiers are developed as interpendent modules of the web application, allowing the replacement or upgrading of any of the three parts.

Model-View-ViewModel and Model View Controller

Angular gives us the ability to easily use MVVM or MVC whenever appropriate. MVVM facilitates the communication between the view and model by allowing the presentation tier objects to directly manipulate application objects directly, while MVC further decouples the view from the model, which allows simultaneous development on both the presentation and application without one affecting the other.

REST

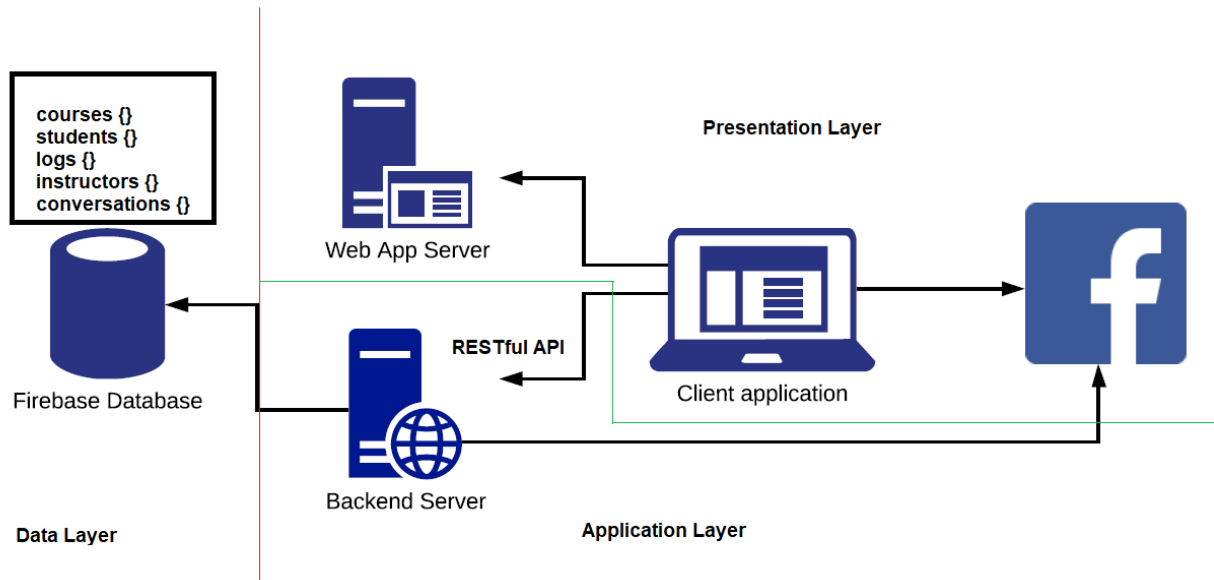
The backend is practically composed of web services for the client application. REST is the standard used for these two parts to communicate. The RESTful backend exposes GET and POST HTTP methods as an API for the client. The client makes method calls to the backend and the backend returns responses formatted in HTML, XML, JSON, or other formats.

Single Page Application

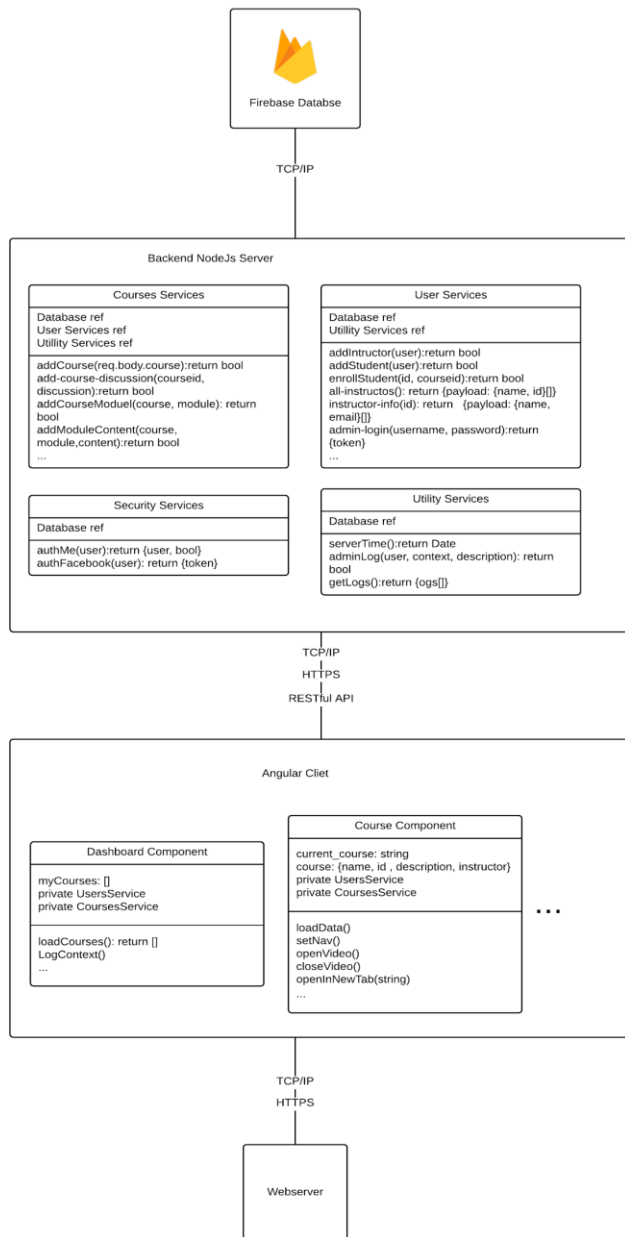
With Multi-Page Applications, the server needs to reload and resend many of the resources rendered in by the user as they navigate the application. By using Angular to build a Single-Page Application, the user doesn't need to update the entire page. Only the required content is rendered, most importantly saving data/bandwidth usage, but also it can cache any local data effectively which eliminate the number of times a message is sent from the client side to the server and back again. There are difficulties with developing SPA's, however the expense of the developer comes with a greater benefit to the user.

System and Subsystem Decomposition

The system is composed of the previously mentioned 3 tiers. The frontend user interface application being host from a web host, and running locally on the user's machine. The RESTful backend running the business logic and communicating with the data layer on behalf of the user interface. Finally, the data layer which is composed of a highly scalable firebase database.



Deployment Diagram



Design Patterns

Front Controller Pattern

In the business logic layer all requests go through a main handler that delegates work to other specialized controllers. This allows to limit the redundant work that it would take to make each controller accept and reply to requests on their own, and enables developers to produce results quicker.

SYSTEM VALIDATION

Test Case ID	LMSF-03-01
Description/Summary of Test	Navigation bar dynamically loads user's courses.
Pre-condition	Student is logged in and fully enrolled in two courses.
Expected Results	Upon loading of navbar component, the two courses this student is enrolled in should be listed under My Courses.
Actual Result	The two courses this student is enrolled in are displayed under my courses.
Status (Fail/Pass)	Pass

Test Case ID	LMSF-03-02
Description/Summary of Test	Course Component reloads courses data on selection of different course.
Pre-condition	Student is logged in at course page and switches to different course, by selecting it from a drop down menu.

Expected Results	All the displayed course information should be replaced by the course information of the newly selected course.
Actual Result	The new course is selected and the correct information is displayed. Correct course title, description, and instructor.
Status (Fail/Pass)	Pass

Test Case ID	LMSF-03-04
Description/Summary of Test	On new post to a discussion navigate to the last page of the discussion.
Pre-condition	User is currently at the last page of a discussion, fifty posts per page, and will add another post to this same discussion.
Expected Results	Upon leaving the new post the user will be redirected to the new last page of this discussion where their post will appear.
Actual Result	The user will be redirected to the new last page of this discussion where their post will appear.
Status (Fail/Pass)	Pass

Test Case ID	LMSF-03-05
Description/Summary of Test	When authorized, signed in as admin/instructor, user can access new module dialog, add content dialog, edit course dialog, add discussion dialog , and edit discussion dialog from course page.
Pre-condition	User is signed in with admin credentials.
Expected Results	Upon navigating to any course page, the user will be able to click on new buttons that will open one of the listed dialogs.

Actual Result	Upon navigating to any course page, the user is able to access new module dialog, add content dialog, edit course dialog, add discussion dialog , and edit discussion dialogs.
Status (Fail/Pass)	Pass

Test Case ID	LMSF-03-06
Description/Summary of Test	Only confirmed students are able to access course and are added to the course's roll call.
Pre-condition	There are no students currently confirmed enrolled in course 001, max classroom size is 2, three attempt to register. Instructor will reject first student and accept two other.
Expected Results	The first student should not be in the students, registered, or waiting lists. The third should move from waiting to register when the first is rejected, and then the remaining two registered students are confirmed and moved to the students list.
Actual Result	The first student is not in the students, registered, or waiting lists. The third moved from waiting to register when the first is rejected. The two remaining students are in students list therefore also in roll call.
Status (Fail/Pass)	Pass

Test Case ID	LMSF-03-07
Description/Summary of Test	Unauthenticated user has no access to courses or it's contents

Pre-condition	User is not logged in to Facebook or through the app as an admin, and attempts to navigate to a course page.
Expected Results	User is redirected to the registration page.
Actual Result	User is redirected to the registration page.
Status (Fail/Pass)	Pass

Test Case ID	LMSF-03-08
Description/Summary of Test	Unauthorized user has no access to restricted admin tools.
Pre-condition	User is not logged in as an admin and therefore has not authorization to use admin functions or access admin pages.
Expected Results	User is redirected to the home page.
Actual Result	User is redirected to the home page.
Status (Fail/Pass)	Pass

Test Case ID	LMSF-03-09
Description/Summary of Test	Logging in for first time allows student to register in backend.
Pre-condition	Student has never signed in, does not allow the app to access it's Facebook information, and they are not in the students or users tables or in any other tables in Firebase.
Expected Results	The student will be prompted to login with Facebook, allow the application to use it's Facebook profile information, prompted to fill out the registration form, and then the Facebook ID as well as the student information filled out in the form will be passed to firebase.

Actual Result	The student was redirected to a Facebook login page, needed to allow the application to use its Facebook information, prompted to complete a registration form, added to the backend with information from the form and the Facebook user ID, logged in and redirected to Home.
Status (Fail/Pass)	Pass

Test Case ID	LMSF-03-10
Description/Summary of Test	A student registered in the same class can send a private message to another individual in the same class, to which the student can reply securely in the conversation.
Pre-condition	The student sending the message must be registered, enrolled in a course, and that course must have at least two other students.
Expected Results	The student will send a message that is only visible to the other students in that same course and a new conversation will be added to the conversation table in the database with the creator of the message, the recipient, the date and time the message was sent, the inbox navigation bar will be automatically populated with fields from the creator, time message was sent, course name, and subject of the message. The replying student will be able to access the private message and upon replying, automatically update the inbox navigation bar with their name and the specific time they replied..
Actual Result	The message is successfully sent, inbox navigation bar is populated, backend tables are populated, date and time is correct, conversation is private, reply updates inbox navigation panel, reply is private, saved in the database.
Status (Fail/Pass)	Pass

GLOSSARY

Angular - A javascript framework for UI (user interface) development.

CLI - Command Line Interface

LMS - Learning Management System

NodeJs - A javascript engine used to run javascript scripts without a browser.

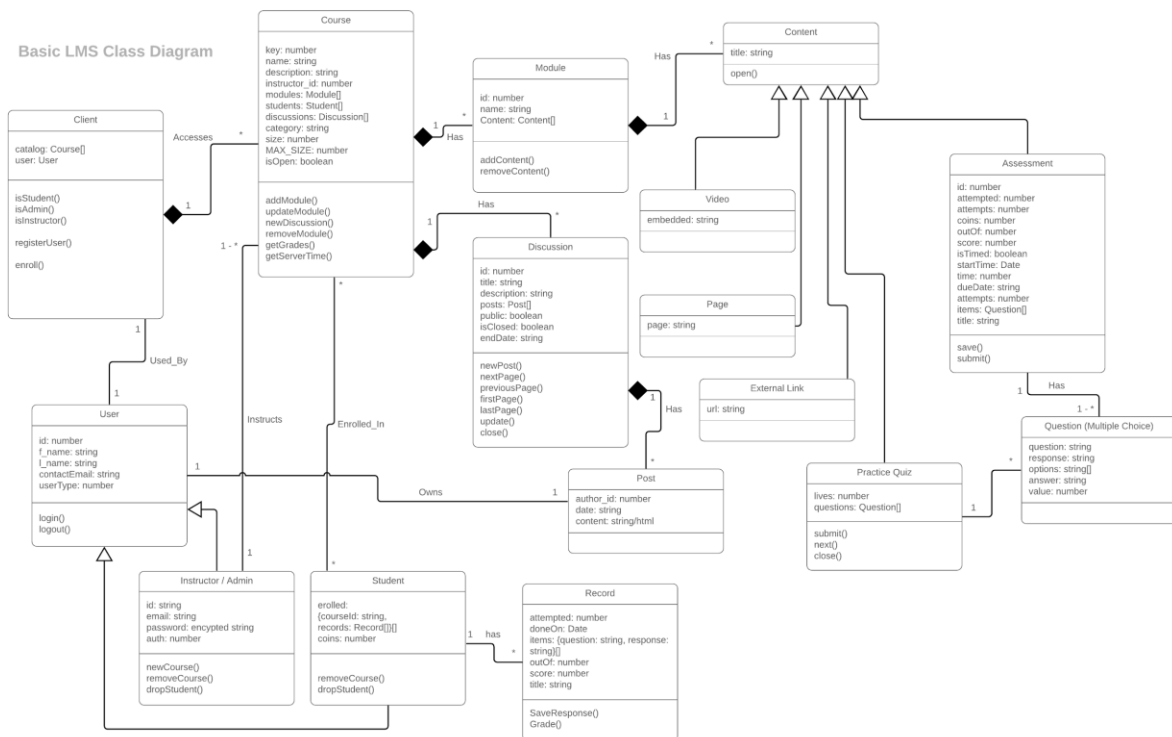
Npm - A package manager for NodeJs

UI - User interface

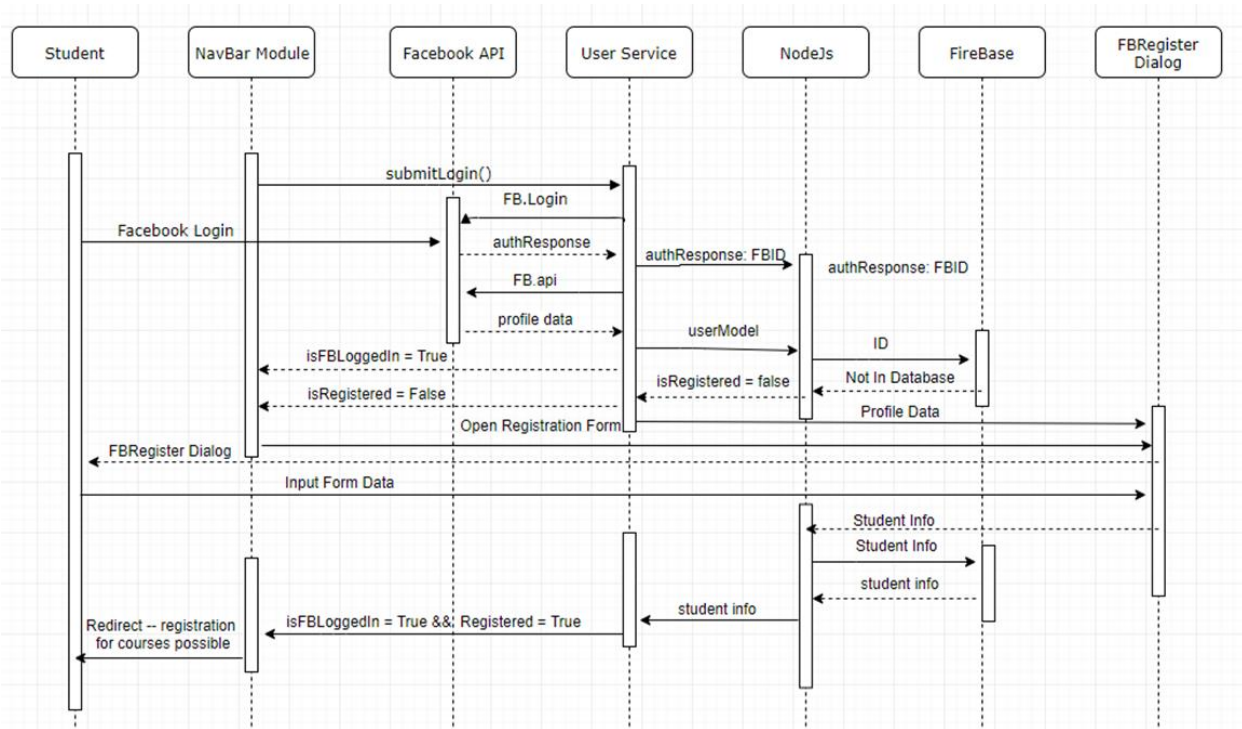
APPENDIX

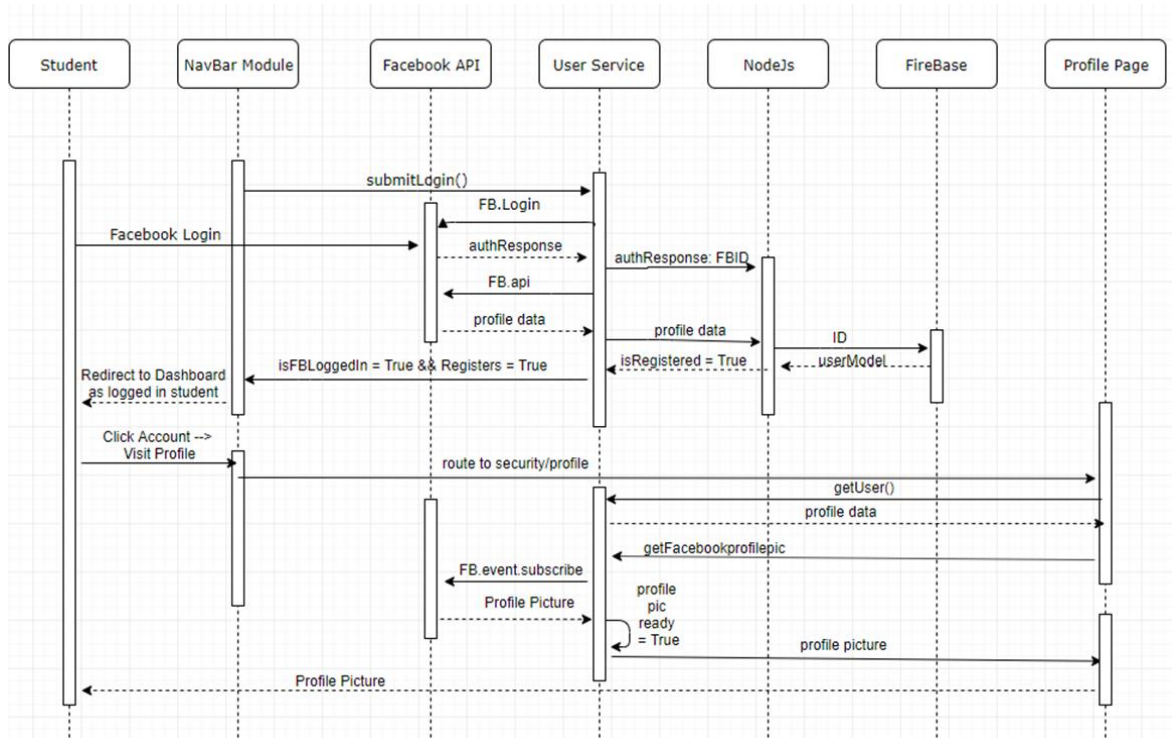
Appendix A - UML Diagrams

LMS Class Diagram



Facebook Registration Sequence Diagram



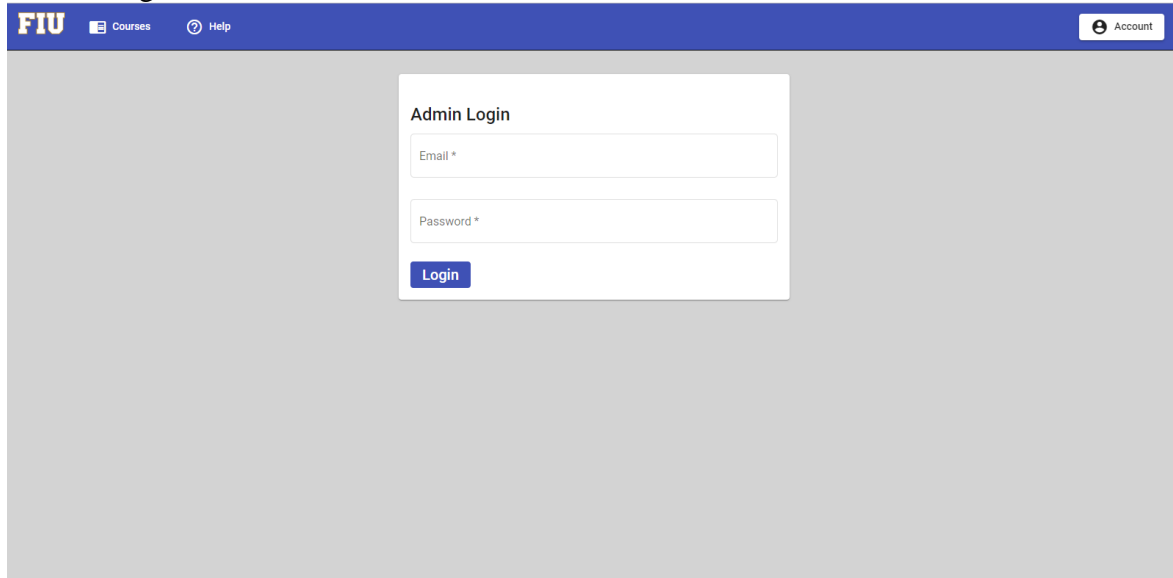
Visit Profile Sequence Diagram

Appendix B - User Interface Design

Home Page



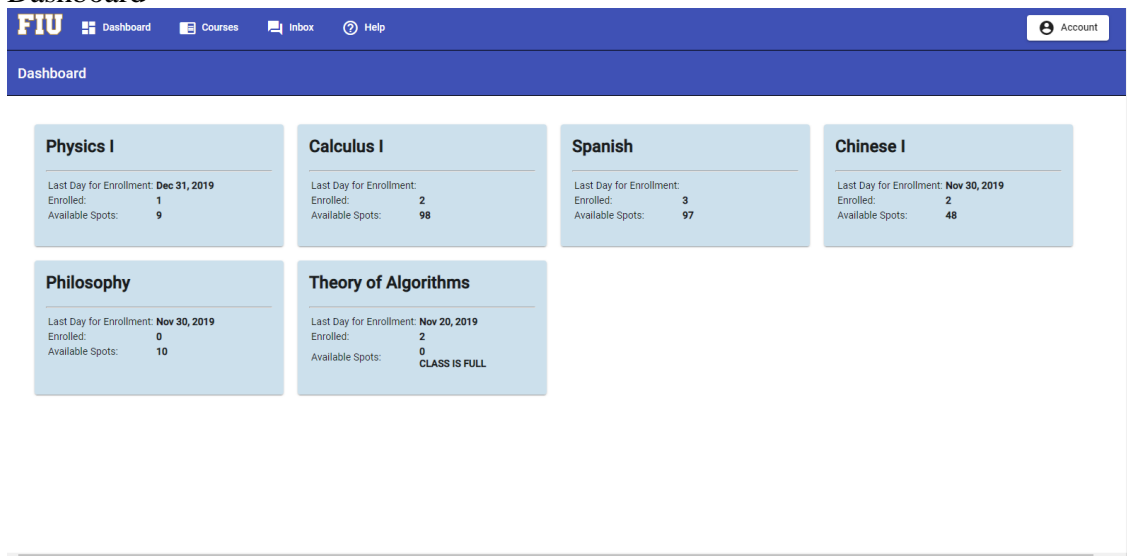
Admin Login



The Admin Login form is centered on a light gray background. It features a white box with the title "Admin Login" at the top. Below the title are two input fields: "Email *" and "Password *". At the bottom of the box is a blue "Login" button. The form is part of a web interface with a dark blue header containing the FIU logo, "Courses", "Help", and an "Account" link.

Admin Login	
Email *	
Password *	
Login	

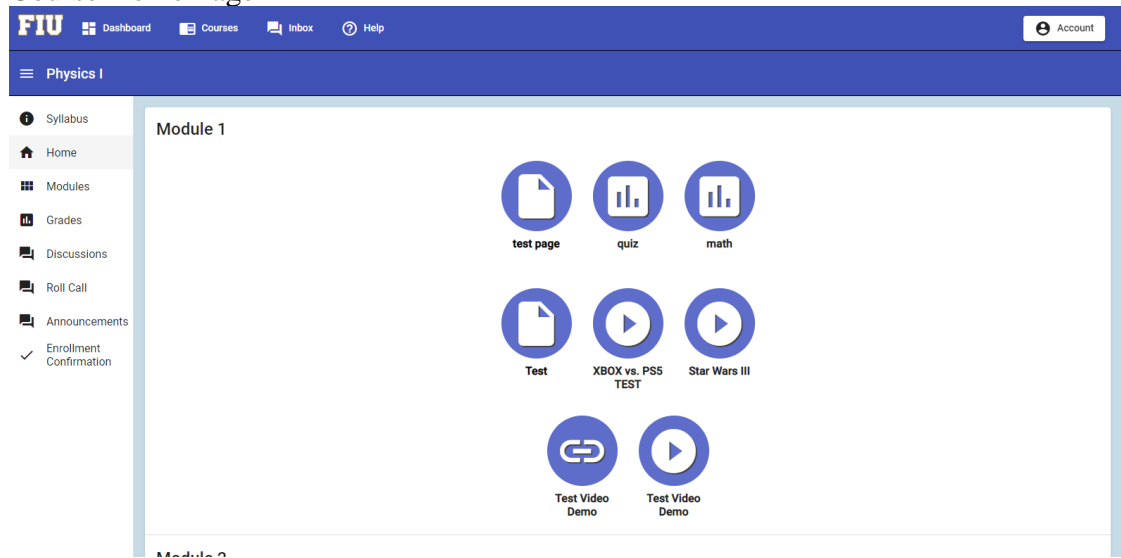
Dashboard

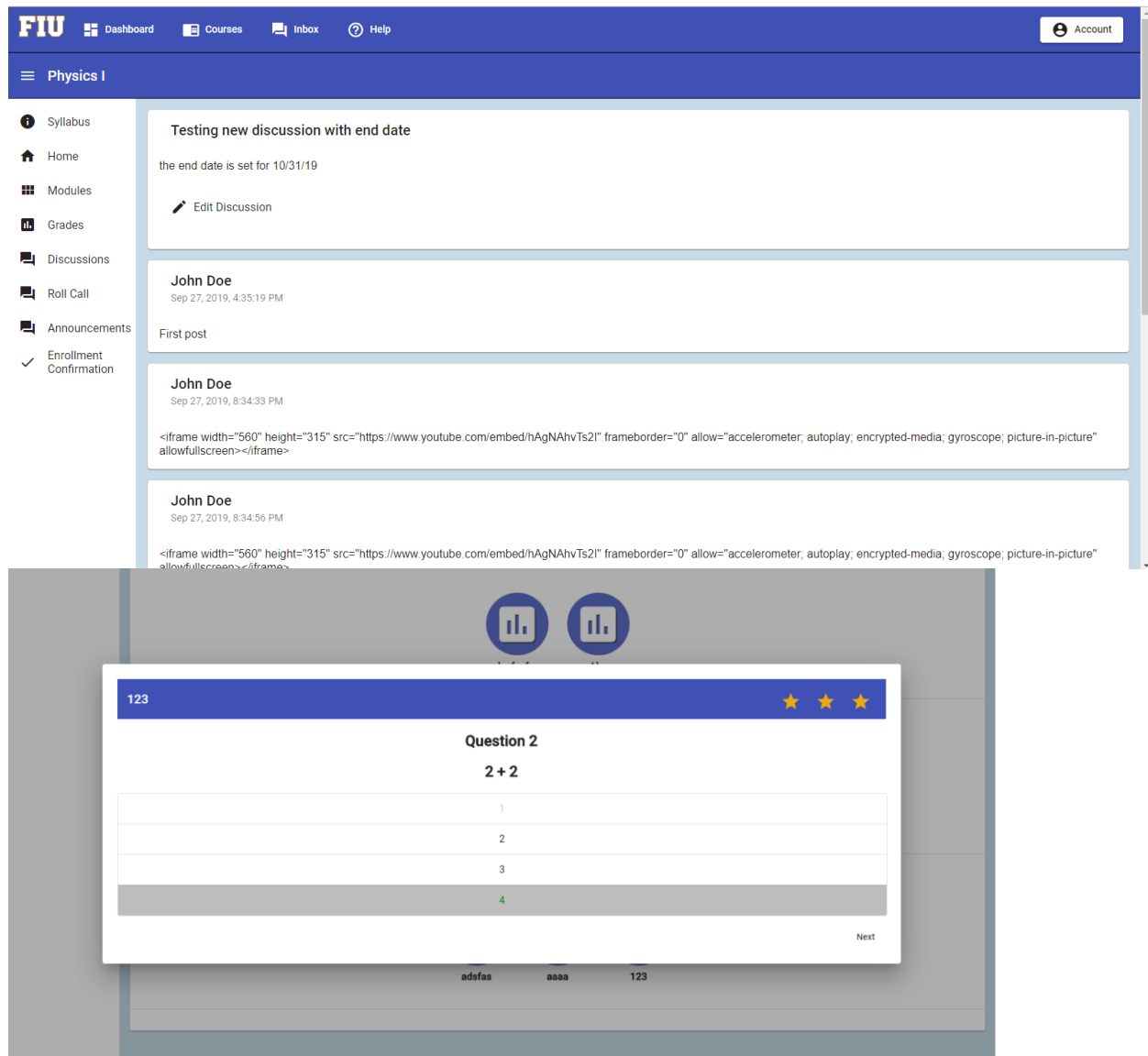


The Dashboard is a web interface with a dark blue header containing the FIU logo, "Dashboard", "Courses", "Inbox", "Help", and an "Account" link. Below the header is a "Dashboard" section with six course cards. Each card displays the course name, the last day for enrollment, the number of enrolled students, and the number of available spots.

Course	Last Day for Enrollment	Enrolled	Available Spots
Physics I	Dec 31, 2019	1	9
Calculus I		2	98
Spanish		3	97
Chinese I	Nov 30, 2019	2	48
Philosophy	Nov 30, 2019	0	10
Theory of Algorithms	Nov 20, 2019	2	0 CLASS IS FULL

Course Home Page

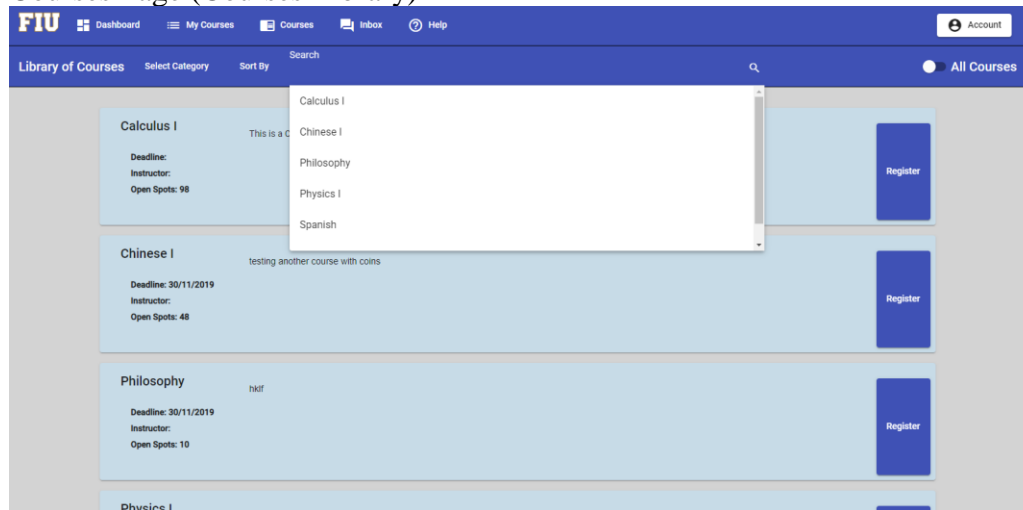




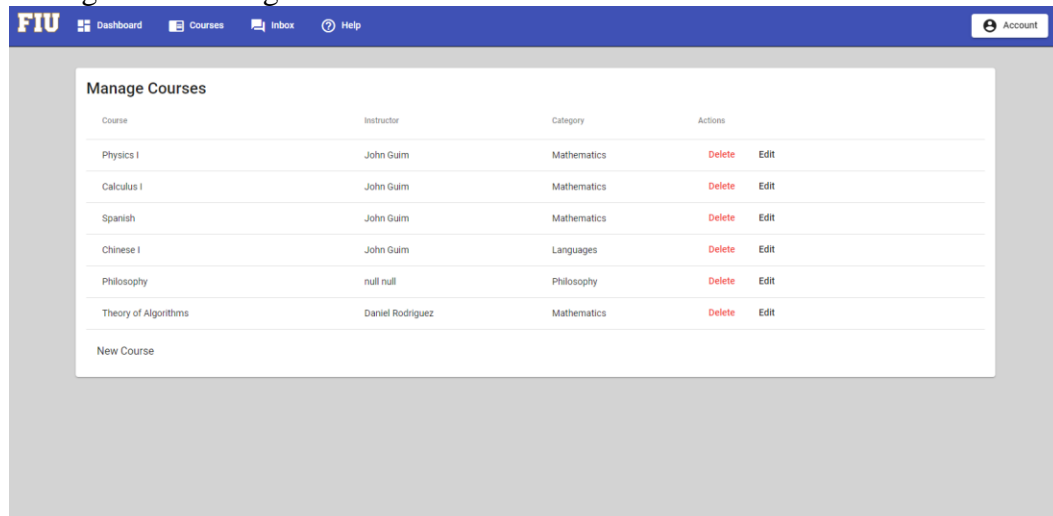
Practice Quiz

A Discussion Page

Courses Page (Courses Library)



Manage Courses Page



Admin Logs

12/04/2019

Page 48 of 60

FIU [Dashboard](#) [Courses](#) [Inbox](#) [Help](#) [Account](#)

View Logs

12/01/2019


Time	Description	User	Action ID	More
18:42:36 PM	Confirming Student Enrollment.	-LoXfTT6729IRZDTaJnY	-Lv2q2RkJQHxG5ORjbtF	⋮
18:43:12 PM	Removing Student from Course.	-LoXfTT6729IRZDTaJnY	-Lv2qB3qUuVoCdD2rWIX	⋮
18:52:22 PM	Confirming Student Enrollment.	-LoXfTT6729IRZDTaJnY	-Lv2sHXsa_JbKjyAHuNI	⋮
18:53:00 PM	Removing Student from Course.	-LoXfTT6729IRZDTaJnY	-Lv2sQcjv86XkwbkvT0u	⋮
18:54:27 PM	Confirming Student Enrollment.	-LoXfTT6729IRZDTaJnY	-Lv2sl2cQ62hEekvgA2C	⋮
20:35:12 PM	Removing Student from Course.	-LoXfTT6729IRZDTaJnY	-Lv3EoupO8TtDTP3iquu	⋮
20:35:39 PM	Confirming Student Enrollment.	-LoXfTT6729IRZDTaJnY	-Lv3EvGpu9o3wB6VFdC_	⋮
21:26:40 PM	Confirming Student Enrollment.	-LoXfTT6729IRZDTaJnY	-Lv3Qak2SGZpCLqghhIC	⋮
21:29:41 PM	Removing Student from Course.	-LoXfTT6729IRZDTaJnY	-Lv3RHuDGO9vD-L2ac2yA	⋮
21:34:41 PM	Confirming Student Enrollment.	-LoXfTT6729IRZDTaJnY	-Lv3SRD3Gj9erc_6oUM7	⋮
22:57:37 PM	Removing Student from Course.	-LoXfTT6729IRZDTaJnY	-Lv3kQSUwDztfLDbk0BP	⋮

Profile Page

FIU [Dashboard](#) [My Courses](#) [Courses](#) [Inbox](#) [Help](#) [Account](#)

Profile [Edit Profile](#)

Daniel's Profile



First Name: **Daniel**
Last Name: **Rodríguez**
Email: **dodr518@fiu.edu**
Phone: **3054391452**
Country: **United States**

Profile Edit Dialog

The screenshot shows a web interface for a Learning Management System on Facebook. At the top, there is a navigation bar with the FIU logo and links to Dashboard, My Courses, Courses, Inbox, Help, and Account. Below this is a 'Profile' section with an 'Edit Profile' button. The main content area displays 'Daniel's Profile' with an 'Edit Profile' dialog box open. The dialog box has the following fields:

- First Name *: Daniel
- Last Name *: Rodriguez
- Student Contact Email *: drodr518@fiu.edu
- Phone Number *: 3054391452
- Country of Origin *: United States

At the bottom of the dialog are two buttons: 'Cancel' (red) and 'Update Student' (blue).

Appendix C - Sprint Review Reports

Sprint #:	1
Date:	9/23/2019
Start:	5:23 AM
End:	5:26 AM
Attendees:	Joao Guimaraes, Danny Rodriguez

Completed Stories			
ID	Story Title	Assigned To	Estimate
76	Navigation Bar	Joao Guimaraes	4
78	Course Page	Joao Guimaraes	10
80	Discussion Page	Joao Guimaraes	6
82	New Discussion Post	Joao Guimaraes	6
84	Database Configuration	Daniel Rodriguez	4
77	Dashboard Page	Daniel Rodriguez	6
85	Log in Page	Daniel Rodriguez	10
86	Help/Support Page	Daniel Rodriguez	6
87	Home Page	Daniel Rodriguez	5
88	Hosting Web App	Daniel Rodriguez	6

Incomplete Stories			
ID	Story Title	Assigned To	New Estimate

Sprint Velocity: 63

Sprint #:	2
Date:	10/07/2019
Start:	9:14 PM
End:	9:39 PM
Attendees:	Joao Guimaraes, Danny Rodriguez

Completed Stories			
ID	Story Title	Assigned To	Estimate
96	Edit Course Dialog	Joao Guimaraes	4
95	Add Discussion Dialog	Joao Guimaraes	4
94	Edit Discussion Dialog	Joao Guimaraes	4
93	Add Content Dialog	Joao Guimaraes	6
91	New Module Dialog	Joao Guimaraes	4
83	New Course Page/ Dialog	Danny Rodriguez	4
97	Roll Call Page	Danny Rodriguez	4

Incomplete Stories			
ID	Story Title	Assigned To	New Estimate

100	Communication Channel Page	Danny Rodriguez	8
98	Publish to Facebook	Danny Rodriguez	4
99	Videos Page	Danny Rodriguez	6

Sprint Velocity: 36

Sprint #:	3
Date:	10/22/2019
Start:	6:58 PM
End:	7:00 PM
Attendees:	Joao Guimaraes, Danny Rodriguez

Completed Stories			
ID	Story Title	Assigned To	Estimate
98	Publish to Facebook	Danny Rodriguez	4
99	Videos Page	Danny Rodriguez	6
115	Confirm Course Enrollment Page	Joao Guimaraes	4
114	Admin/Instructor Login	Joao Guimaraes	6
113	Multiple Choice Assessment Page	Joao Guimaraes	6

Incomplete Stories			
ID	Story Title	Assigned To	New Estimate
100	Communications Channel Page	Danny Rodriguez	10
116	Student Account	Joao Guimaraes	6

Sprint Velocity: 26

Sprint #:	4
Date:	11/05/2019
Start:	7:30 PM
End:	7:40 PM
Attendees:	Joao Guimaraes, Danny Rodriguez

Completed Stories			
ID	Story Title	Assigned To	Estimate
122	Authenticate with Facebook	Danny Rodriguez	10
120	Login Page	Danny Rodriguez	8
121	Profile Page	Danny Rodriguez	6
118	Admin/Instructor registration	Joao Guimaraes	4

119	User dependent navigation	Joao Guimaraes	4
123	Courses Catalog with Pagination	Joao Guimaraes	4
116	Student Account	Joao Guimaraes	6
124	Browse Catalog by Category	Joao Guimaraes	4
126	User Course Enrollment	Joao Guimaraes	4

Incomplete Stories			
ID	Story Title	Assigned To	New Estimate
100	Communications Channel Page	Danny Rodriguez	4

Sprint Velocity: 50

Sprint #:	5
Date:	11/18/2019
Start:	9:31 PM
End:	9:35 PM
Attendees:	Joao Guimaraes, Danny Rodriguez

Completed Stories			
ID	Story Title	Assigned To	Estimate
125	Course Searching	Joao Guimaraes	5
132	Admin Actions Logging	Joao Guimaraes	5
131	Remove Course Module	Joao Guimaraes	3
133	Get percent method bug	Joao Guimaraes	3
134	Manage Courses Page	Joao Guimaraes	5
135	Inbox Page	Danny Rodriguez	10
136	Compose Message Dialog	Danny Rodriguez	4
137	Course Announcement Page	Danny Rodriguez	5
138	Code Refinement**	Danny Rodriguez	10

Incomplete Stories			
ID	Story Title	Assigned To	New Estimate

Sprint Velocity: 49

Sprint #: 6

Date:	12/3/2019
Start:	6:30PM
End:	8:00PM
Attendees:	Joao Guimaraes, Danny Rodriguez

Completed Stories			
ID	Story Title	Assigned To	Estimate
142	Enhance Profile Page	Danny Rodriguez	5
143	Enhance Dashboard Page	Danny Rodriguez	5
144	Enhance Help Page	Danny Rodriguez	3
145	Refine NavBar UI	Danny Rodriguez	5
146	Document Developer Setup	Danny Rodriguez	5
147	Enhance Videos Upload/Embed	Danny Rodriguez	5
141	Game Currency	Joao Guimaraes	5
140	Catalog Sorting Options	Joao Guimaraes	5
139	Gamified Practice Quizzes	Joao Guimaraes	7
92	Course Sequence	Joao Guimaraes	8

Incomplete Stories			
ID	Story Title	Assigned To	New Estimate

Sprint Velocity: 53

Appendix D - User Manuals, Installation/Maintenance Document, Shortcomings/Wishlist Document and other documents

INSTALLATION GUIDE

1. Configure your Development Environment
 - a. Windows 10 (Licenses can be obtained from Azure Student with FIU account)
 - b. Visual Studio Code (<https://code.visualstudio.com/>)
 - c. NodeJs LTS (<https://nodejs.org/en/>)
 - d. npm (should come with NodeJs LTS)
 - e. Angular CLI (Global requirement) (\$ npm install -g @angular/cli)
 - f. Generate SSL key and certificate and replace them
 - g. - Add '127.0.0.1 myhost.local' to 'C:\Windows\System32\drivers\etc\hosts'
2. Access to Project Source Code
 - a. A zip file containing the source code will be provided
 - b. Extract the Project folder into the development environment
3. Get Project Dependencies
 - a. In both , the backend and client root folders, run (npm install)
4. Access to the Firebase Database Instance
 - a. If you don't have a Google account create one and signup for Google Cloud Platform

- b. Create a new project
 - c. Create a new Firebase Instance
 - d. Generate an access key (learnfiu_db.json) and place it in the backend's root directory
- 5. Access to the Facebook App from developers.Facebook.com
 - a. The same process as above applies, you will need to go to <https://developers.facebook.com>, and set up an account
 - b. Copy the 'APP ID' and replace the old one in two places:
 - i. ~/client/src/app/app.config.ts
 - ii. ~/Backend/app/security/passport.strategy.js
- 6. Run Project in Development Environment
 - a. Run 'npm run dev' in Backend folder
 - b. Run 'ng serve' in client folder
- 7. Run Project in Production
 - a. Deploy Node Backend with Valid SSL certificates and update '~\client\src\environments\environment.prod.ts' appropriately with new domain
 - b. Build client by:
 - i. Running 'ng build --prod'
 - ii. Moving the content of the 'dist' to your webserver
 - iii. Configuring missing files to fallback on index.js (.htaccess file included)

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