

**Lab 1 – Monarch Course Explorer Product Description**

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CS 411W, Fall 2023

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17 November 2023

Version 2

## Table of Contents

<b>List of Tables .....</b>	<b>3</b>
<b>1. Introduction.....</b>	<b>4</b>
<b>2. Monarch Course Explorer Product Description.....</b>	<b>6</b>
2.1 Solution .....	6
2.2 Solution Characteristics.....	7
2.3 Key Product Features and Capabilities .....	8
2.3.1 Core product features .....	8
2.4 Major Components (Hardware/Software) .....	8
<b>3. Identification of Case Study .....</b>	<b>10</b>
<b>4. Monarch Course Explorer Product Prototype Description.....</b>	<b>10</b>
4.1. Prototype Architecture (Hardware/Software) .....	13
4.2. Prototype Features and Capabilities .....	13
4.2.1 Analyze and extract information from syllabi .....	13
4.2.2 Feedback on courses .....	14
4.2.3 Assist students in finding courses that fit their learning style and personal schedule.....	16
4.2.4 Authentication .....	17
4.3. Prototype Development Challenges .....	18
4.4 Real World Product Risks .....	19

<b>5. Glossary .....</b>	<b>21</b>
<b>6. References .....</b>	<b>22</b>

### **List Of Figures**

Figure 1 Current Process Flow	6
Figure 2 Proposed Solution Flow	7
Figure 3 Major Functional Component Diagram	9
Figure 4 Syllabus Algorithm Flow Chart	14
Figure 5 Feedback Algorithm Flow Chart	15
Figure 6 Recommendation Algorithm Flow Chart	17

### **List of Tables**

Table 1 Syllabi Features Functionality	11
Table 2 Syllabi Features & Functionality	11
Table 3 Feedback Features & Functionality	12
Table 4 Other: Features & Functionality	12

## **1. Introduction**

College students, especially ODU college students, lack the necessary information required to create a class schedule that fits around their personal or work schedule. Since 81% of students in the U.S. work jobs while in college, according to Min (Maggie) Wan (2022), it is imperative that students know complete class schedules and syllabi information weeks before the college semester starts, not when college is starting again, for adequate time to avoid conflicts between work, school, and other personal commitments.

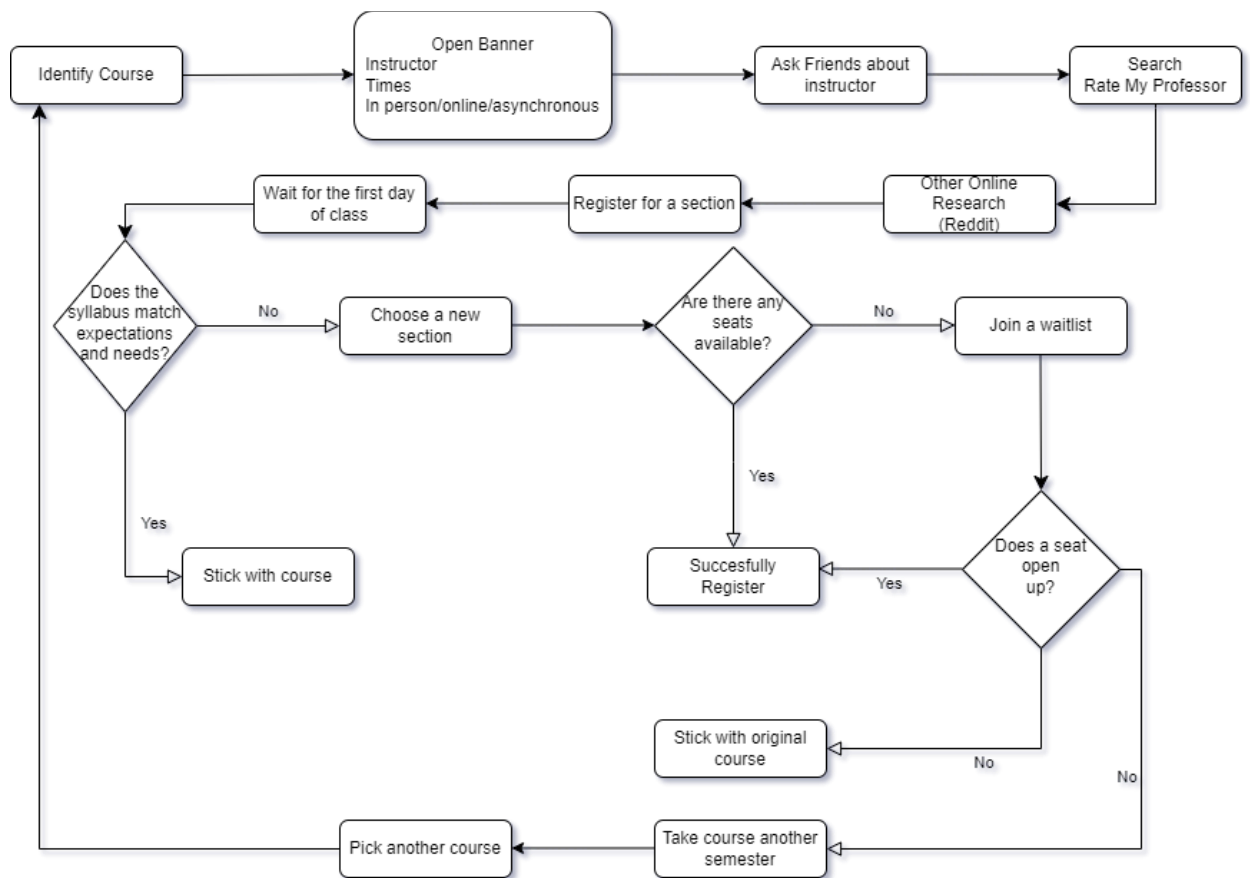
One of the major components of the problem is that ODU currently does not have a tool that faculty and students can use to create more customizable and productive learning experiences. Faculty and students lack a way to communicate how classes are taught, as well as detailed information about what is taught, leading to poor feedback for professors and losses of time and money for students.

Consider an example student, John. John is a transfer student from TCC (or another community college) studying online while also working a full-time job. John needs to register for classes soon, before the next semester starts, but also needs to make sure there are no conflicts with his current full-time job so he can continue to work full-time and meet his financial obligations (bills, rent or mortgage, insurance, etc). Because John works full time and studies online, he may not have had the chance to physically go to campus to get to know other students and professors and get personal insight onto which classes with which professors he should take to maximize his academic success.

Because John has to physically go to work and be focused on work to do his job effectively, he may not always be able to attend virtual classes through Zoom or other video

conference platforms. He goes to his Academic Advisor for more information. The Academic Advisor is great clarifying most questions, but lacks detailed information about how the courses are ran by the professors. Is this class I am planning to enroll in person require mandatory physical attendance? Is it in person, but sessions are recorded for later viewing online? Is it a hybrid class where there are in person sessions but the sessions are also streamed live on Zoom. Is it in person with only mandatory physical attendance for quizzes and tests? All of these are important questions John needs to know soon to avoid any conflicts with his full-time job.

Since the advisor, nor anyone John talks to or finds info about online, knows for sure how the classes are actually run, John is forced to correlate the classes schedule times himself and hope there is no conflict with his current full-time job. When the semester starts and the online classes open up for John to view the classes, John is surprised to see that one of his classes requires him to show up in person in the morning (during his working hours) in order to take tests, even though the class said online only. John now has to scramble to find another class quickly before the add/drop deadline in order to find another class that is open and does not conflict with his schedule. This current process is shown in Figure 1.

**Current Process Flow***Figure 1 Current Process Flow***2. Monarch Course Explorer Product Description**

The Monarch Course Explorer Product Description is described in sections 2.1, 2.2, 2.3, and 2.4.

**2.1 Solution**

Monarch Course Explorer is a moderated platform where students can provide and view feedback about courses, view automatic comparisons between semesters and teachers, and access and upload syllabi.

## 2.2 Solution Characteristics

There will exist a central repository of course syllabi, which students and faculty can view. Students can provide and view constructive feedback about classes, which can be sorted by semester and faculty. Faculty will be able to view and comment on feedback from students. Faculty will also be able to make changes to their courses based on feedback from students as well as make their syllabi more accessible to students. These solution characteristics will ultimately aid Curriculum Review Committee members (also known as Curriculum Committee members or CCM's) with evaluating course syllabi for future courses. The proposed solution flow for these solution characteristics is shown in Figure 2.

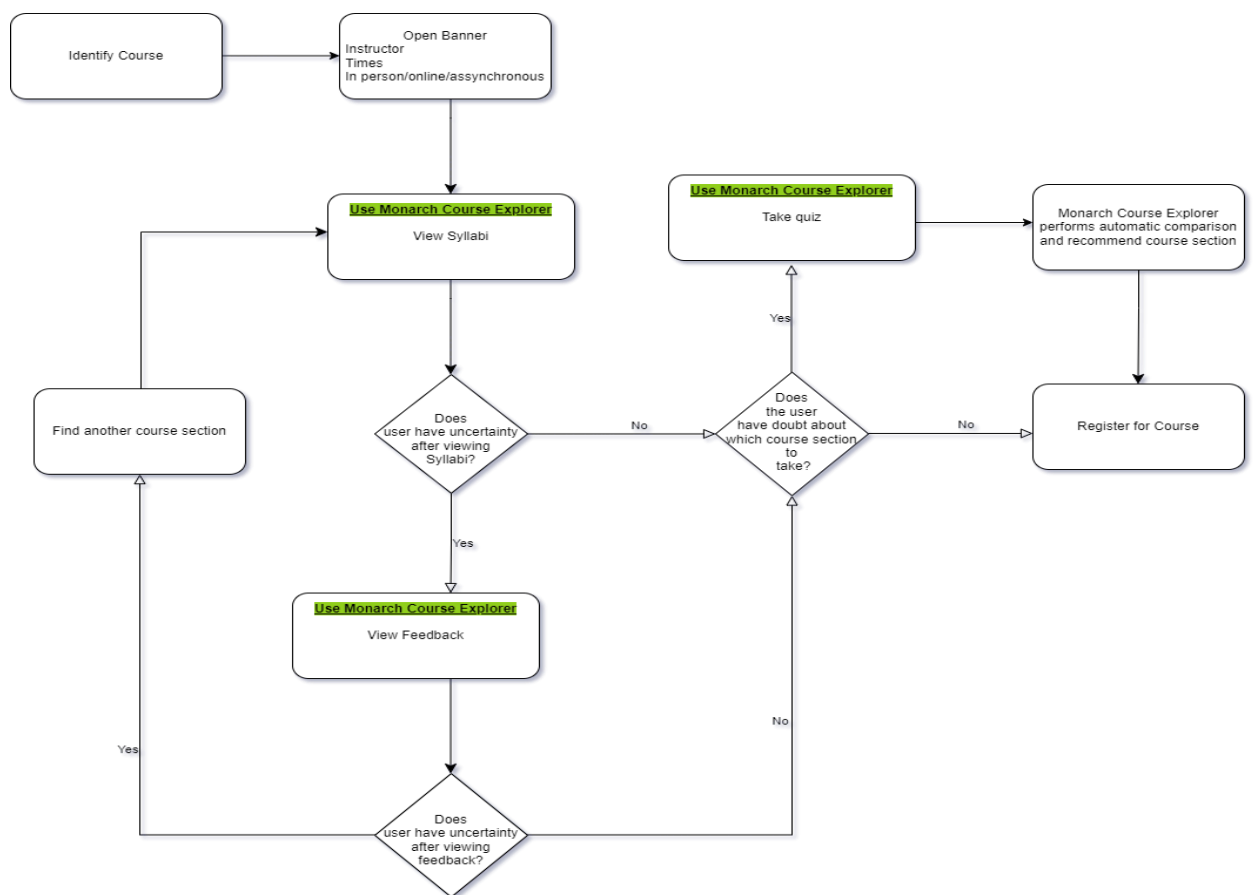


Figure 2 Proposed Solution Flow

## 2.3 Key Product Features and Capabilities

The Key Product Features and Capabilities of Monarch Course Explorer are described in subsections 2.3.1.

### 2.3.1 Core product features

The software will allow access to course syllabi and syllabi comparisons. The software will provide a platform for verified ODU students to provide feedback on courses, and also provide students with more information about courses to fit their learning style. For faculty, timely feedback is provided for professors, which also aids curriculum review committees with evaluating course syllabi. The Monarch Course Explorer gives advisors the tools and resources needed to create a more personalized advising experience.

The unique features for the Monarch Course Explorer are as follows. Comprehensive course information ensures students have the correct information to choose the classes they need. Automatic comparisons between semesters or faculty allows students to decide which professors are best for their preferred learning style. Verified ODU emails confirm that only ODU students and faculty are able to access the Monarch Course Explorer and its resources. Concluding these unique features is the ability to receive customized recommendations for a set of classes to take for an upcoming semester.

## 2.4 Major Components (Hardware/Software)

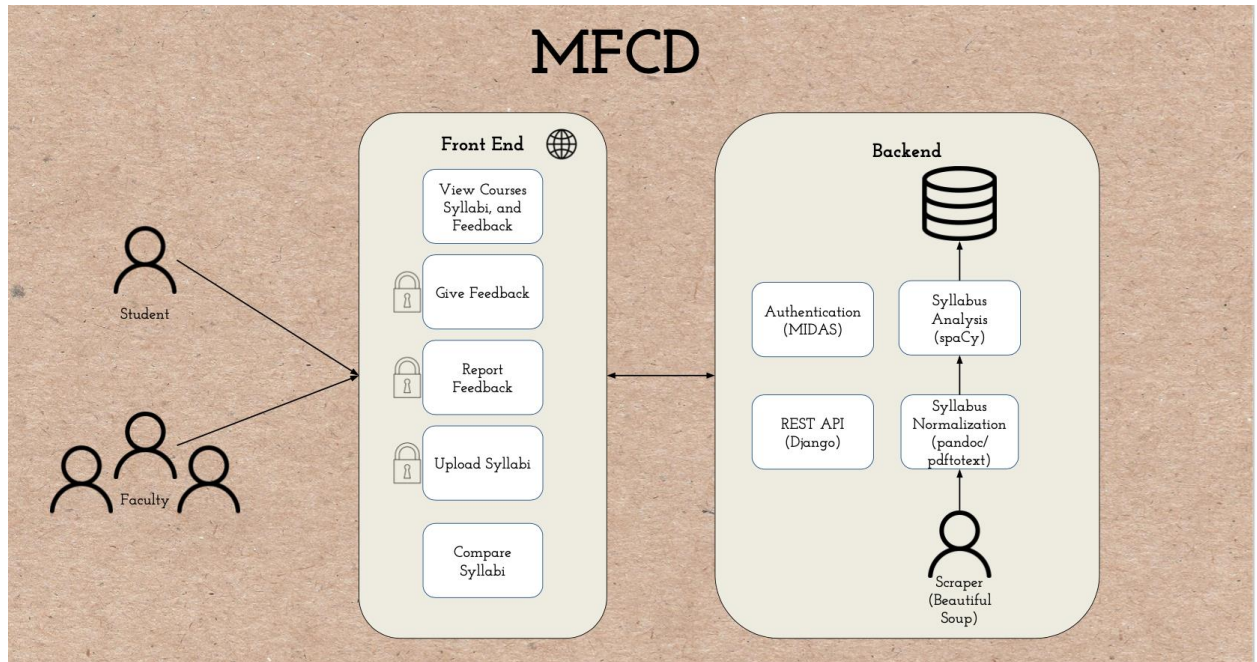
On the front end, users can view and compare syllabi as well as viewing feedback without having to sign up. Features such as uploading syllabi, giving feedback, and reporting feedback will require users to sign up. On the backend, syllabi will be scraped, normalized,



analyzed, and stored in a database. Users will be authenticated with their MIDAS information.

Figure 3 Major Functional Component Diagram shows the Major Components.

### Major Functional Component Diagram



*Figure 3 Major Functional Component Diagram*

For the website, we plan to use HTML for the user display, CSS for formatting and design, and JavaScript for user interactions such as text boxes and radio buttons. We plan to use Python as our main backend language, using the Python libraries Beautiful Soup for Web Scraping, spaCy for NLP transformation of syllabi, and Django for the Rest API. For the backend database we plan to use PostgreSQL. For authentication we plan to use MIDAS, or another equivalent authentication system in case we cannot get API access to MIDAS. The Monarch Course Explorer will run on any device that supports a web browser such as Google Chrome, Microsoft Edge, and Mozilla Firefox.

### **3. Identification of Case Study**

Monarch Course Explorer is first planned to be deployed on ODU's web portal at portal.odu.edu. This product will be deployed for current ODU in person, online, and hybrid students as well as ODU current faculty including professors, advisors, and curriculum committee members. These uses will test the various features of Monarch Course Explorer to determine if the software meets their current needs. In the future, Monarch Course Explorer is planned to be rebranded to a generic "College Course Explorer" or "Course Explorer" for other universities to use.

### **4. Monarch Course Explorer Product Prototype Description**

Monarch Course Explorer is designed for students and faculty for reviewing class syllabi and providing feedback efficiently. The prototype for Monarch Course Explorer is currently a proof of concept which will implement key features and capabilities of the Real-World Product. These features are shown in Table 1, Table 2, Table 3, and Table 4.

*Table 1 Syllabi Features Functionality*

Features	Student	Faculty: Professor	Faculty: Advisor	Faculty: Curriculum Committee Member	Real World Product	Prototype
Upload Syllabi		✓		✓	✓	✓
Scrape Syllabi		✓		✓	✓	✓
View Syllabi	✓	✓	✓	✓	✓	✓
Side-By-Side View	✓	✓	✓	✓	✓	✓
Analyze Syllabi in Different Formats					✓	Partial

*Table 2 Syllabi Features & Functionality*

Features	Student	Faculty: Professor	Faculty: Advisors	Faculty: Curriculum Committee Member	Real World Product	Prototype
Verify Inclusion of Required Sections				✓	✓	✓
View Report of Missing Sections				✓	✓	✓
Filter by Sections	✓		✓	✓	✓	✓
Compare sections	✓		✓	✓	✓	✓

*Table 3 Feedback Features & Functionality*

Features	Student	Faculty: Professor	Faculty: Advisor	Faculty: Curriculum Committee Member	Real World Product	Prototype
View Feedback	✓	✓	✓		✓	✓
Rate Feedback	✓	✓			✓	✓
Provide Feedback	✓	✓			✓	✓
Filter Feedback by Semester	✓	✓	✓		✓	✓

*Table 4 Other: Features & Functionality*

Features	Student	Faculty: Professor	Faculty: Advisor	Faculty: Curriculum Committee Member	Real World Product	Prototype
Authentication	✓	✓	✓	✓	✓	Partial
Take Quiz	✓				✓	✓
View Course Recommendation	✓				✓	✓

#### 4.1. Prototype Architecture (Hardware/Software)

The hardware requirements of the Prototype are basically any electronic device which can access the internet and access a web page, such as a Desktop PC, a Laptop PC, or a mobile device such as an Android phone or Iphone.

For the software requirements, the standard trifecta of HTML, CSS, and JavaScript is to be used for the front-end website. For the backend data processing, Python and its applicable libraries are to be used. These libraries mainly include Beautiful Soup for web scraping, spaCy for NLP transformation of syllabi, and Django for the REST API. For the backend database, PostgreSQL is planned to be used, with Docker virtual containers if needed. The following Development Tools will be used. Github for the main code repository and VSCode for the IDE.

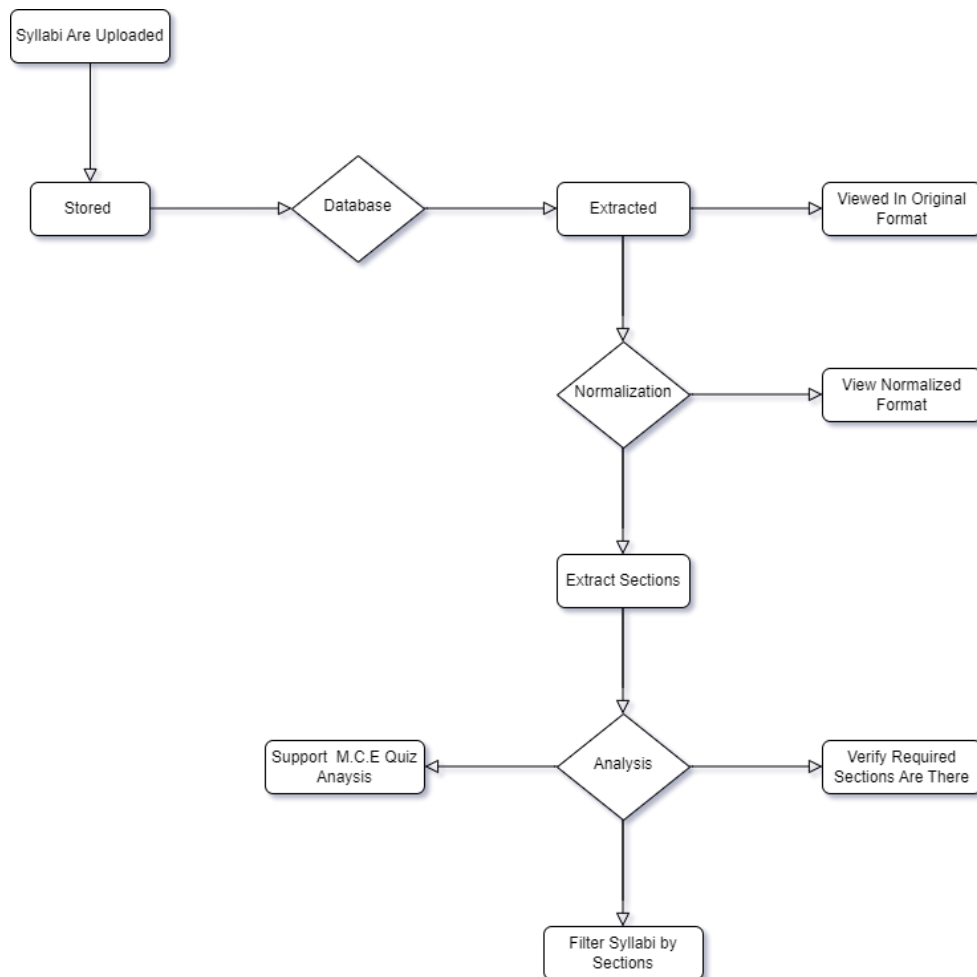
#### 4.2. Prototype Features and Capabilities

The features and capabilities of the Monarch Course Explorer prototype are previously shown in Table 1, Table 2, Table 3, and Table 4. These features will also be described in the subsections 4.2.1, 4.2.2, 4.2.3, and 4.2.4.

##### 4.2.1 Analyze and extract information from syllabi

The Monarch Course Explorer prototype will allow Faculty Professor and Faculty Curriculum Committee Members (CCMs) to upload their syllabi and have it scraped by the prototype, as well as being able to view and compare them side by side. This process will be partially implemented due to the vast variety of different syllabi formats currently at ODU. These features will aid CCMs to evaluate course syllabi and make future changes when needed.

Student users and faculty users will be able to easily search and access syllabi for all courses listed in Monarch Course Explorer. All users will be able to access all original syllabi as well as their normalized forms. All users will be able to filter syllabi by sections, as well as comparing sections of different syllabi. The algorithm for supporting these processes is shown in Figure 4 Syllabus Algorithm Flow Chart.

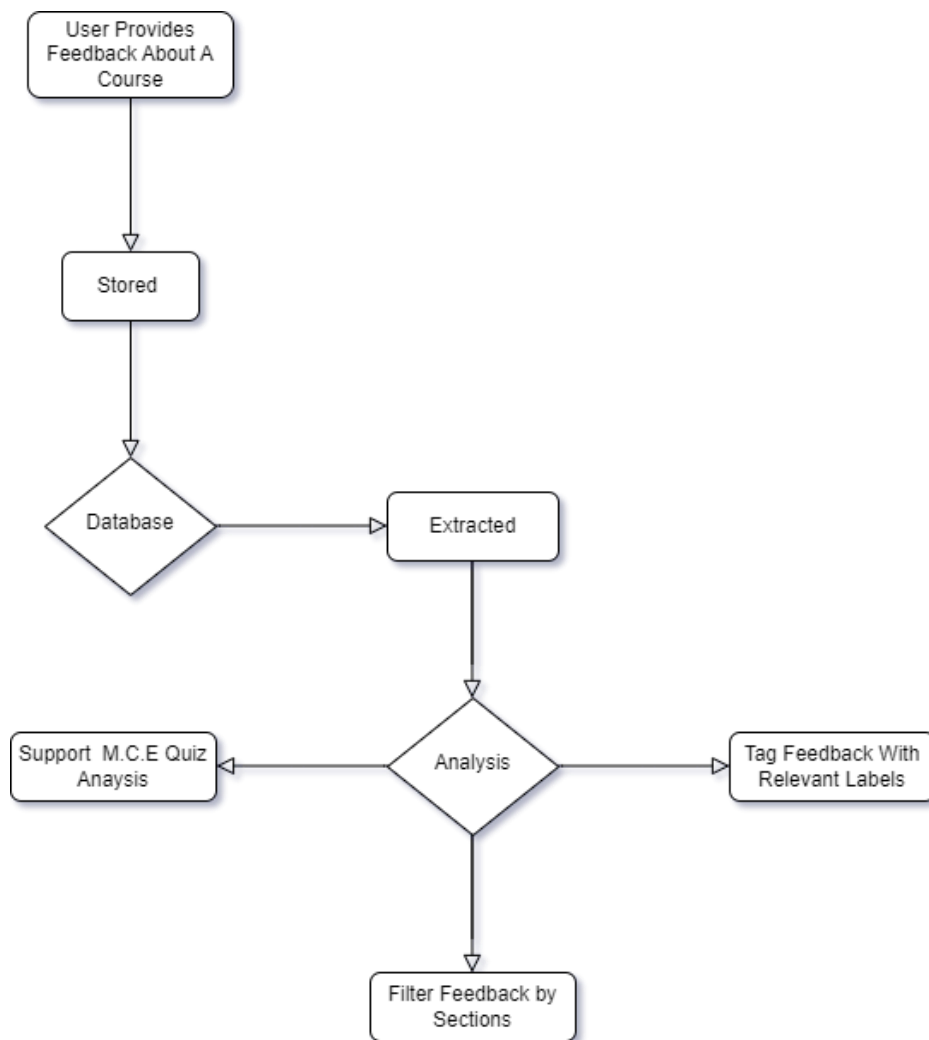


*Figure 4 Syllabus Algorithm Flow Chart*

#### 4.2.2 Feedback on courses

For Feedback on courses listed in Monarch Course Explorer, the students will be able to provide feedback on courses as well as filter feedback to find applicable feedback from previous

students. Professors will be able to view, rate, respond to, and filter feedback as needed to find the most applicable feedback. Lastly, advisors will be able to view feedback and filter to find applicable feedback for their advising needs. The algorithm to support these processes is shown in Figure 5 Feedback Algorithm Flow Chart.



*Figure 5 Feedback Algorithm Flow Chart*

#### 4.2.3 Assist students in finding courses that fit their learning style and personal schedule

The Monarch Course Explorer will assist students with finding courses to fit their learning style and personal schedule. It will do this by allowing students to take the Monarch Course Explorer Quiz (M.C.E Quiz), which will guide students in recommending the correct classes to sign up for. The algorithm that supports these processes is shown below in Figure 6 Recommendation Algorithm Flow Chart.



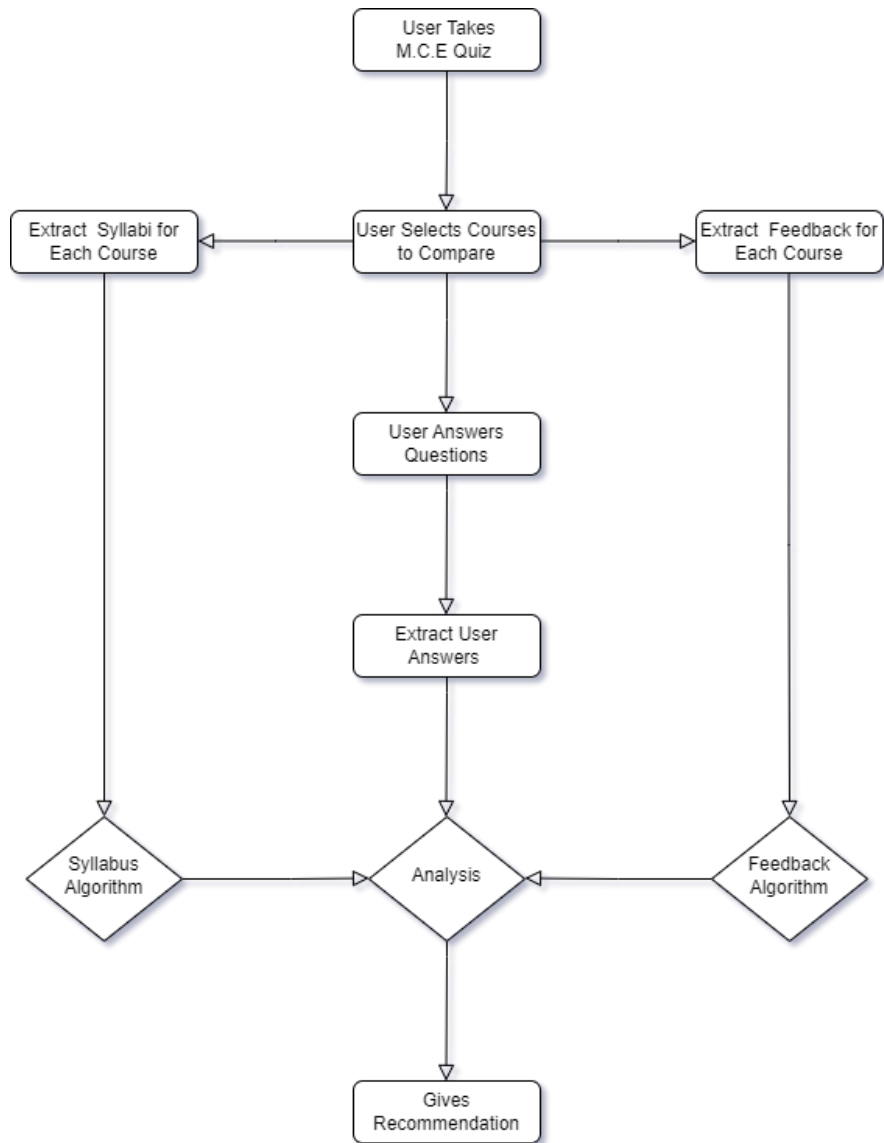


Figure 6 Recommendation Algorithm Flow Chart

#### 4.2.4 Authentication

Authentication to verify that a user is either an ODU student and or ODU faculty member will be needed for the integrity of Monarch Course Explorer. This feature will be partially implementation because it is highly unlikely that ODU will give us access to the MIDAS API for security reasons.

#### 4.3. Prototype Development Challenges

There are a few challenges that could potentially affect the development of the Monarch Course Explorer prototype. These risks are described in the next paragraphs below.

There will always be a chance that the Natural Language Processing (NLP) algorithms produce inaccurate results when analyzing the Syllabi and Feedback. In such cases, student and faculty will need either manually edit the correction in themselves and/or mark the information as inaccurate for manual review and editing.

Data collection is another challenge for the development of Monarch Course Explorer. Obtaining syllabi that is not already posted online may require students to manually notify their professors or CCM's either through the app or outside the app in order for the professor or CCM to manually upload the needed syllabi. Also, motivating students to provide feedback for their courses after they have finished them can prove to be a challenge, as some students may feel "burnt out" at the end of a semester and may not want to do any more perceived work, especially when it is not a mandatory requirement.

To wrap up the prototype development issues, normalization of syllabi may cause explicit information as well as implied information to be left out. An example of explicit information could be something at the very bottom of the page similar to: "All late assignments will incur a 10% penalty, but all assignments are due by the end of the semester." An example of implied information could be: "Make sure you schedule all test at least a week in advance." The student could schedule all tests the day before, but it is implied that scheduling tests at least a week in advance will allow the student a wider selection of times to choose from, as well as possibly more time to study.

#### 4.4 Real World Product Risks

Since the Monarch Course Explorer is not currently planned to be implemented in ODU's real world Canvas environment, it is not possible to predict every real-world product risk that can occur. Nevertheless, some of the most prominent real-world risks are described in the next few paragraphs.

The main danger for any review platform is the abuse of the platform either by students or faculty for posting inappropriate or inaccurate feedback. The mitigation for this would be a combination of human and automated moderation to ensure all cases of abuse are handled thoroughly.

One of the main technical risks for the real-world product include producing and training web scrapers for every website which hosts syllabi and review information. The mitigation for this is prioritizing high value websites such as the ODU website, and ratemyprofessors.com in order to get the best information available. Another major technical risk is that automatic moderation may inadvertently hide good feedback while trying to moderate questionable feedback. To mitigate this, industry best practices will be used to moderate questionable feedback and tactics such as review bombing while still allowing positive and helpful feedback to be posted and viewed.

Security is another important risk to be mitigated, especially when storing potentially personal feedback and other personal information. To mitigate this, the Monarch Course Explorer will be designed and implemented with the best security industry practices in mind. These practices include Two-Factor Authentication and parameterized queries.

The final risk to discuss is the legal risk. Some websites may not approve of having their information scrapped without prior consent and may issue Cease and Desist letters to stop the real-world product from scraping those websites. The mitigation for this is to manually review the respective ToS (Terms of Service) before scraping the website, so that Monarch Course Explorer can be configured to either honor the specific terms for web scraping, or configured to not scrape the website at all.

## 5. Glossary

**Beautiful Soup:** A Python library for parsing structured data.

**Django:** A free and open-source, Python-based web framework that follows the model–template–views architectural pattern.

**HTML:** Hypertext Markup Language, standard markup language for documents designed to be displayed in a web browser.

**MIDAS:** Monarch Identification and Authorization System, Old Dominion University’s log-in and password management system.

**NLP:** A subfield of computer science and artificial intelligence (AI) that focuses on the interaction between computers and humans in natural language.

**PostgreSQL:** A free and open-source relational database management system emphasizing extensibility and SQL compliance.

**RWP:** Real World Product that will be developed and used.

**spaCy:** An open-source software library for advanced natural language processing, written in the programming languages Python and Cython.

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