

# SKEDGE

**Smarter course scheduling for our  
University of Rochester**

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## **Abstract**

In this paper I present Skedge, a web application for students to comfortably and effectively engage with the University’s course catalog. Skedge matches and surpasses the capabilities of the existing University tool for this purpose, “Course Description / Course Schedule” (CDCS) and presents its information in a more visually pleasing way. As a result, Skedge boasts strong user-retention rates, long session durations, and high student adoption despite having virtually no advertisement. Through collected usage data, I demonstrate that a) Skedge’s differences from and additions to CDCS are usable and have real need, b) the two major use-cases associated with course browsing—direct search and exploratory search—are effectively accommodated by Skedge, and c) Skedge’s search mechanism is user-friendly and self-teaches to users over time.

# Chapter 1


## Introduction

This paper will begin by

**1.1 Space of course explorers and schedulers**

**1.2 Overview of CDCS**

**1.3 Overview of Skedge**



COURSE DESCRIPTION  
COURSE SCHEDULE

Course Description / Course Schedule (CDCS)

Search

Year/Term: (Required)  
 Fall 2016

School:

Subject:

Course: (MTH 162 or MTH or 162)  
 csc

Course Type:

Status:

Description - Keywords:

Title:

Instructor Name:

Day: ☐ M ☐ T ☐ W ☐ R ☐ F ☐ S ☐ U

Start Time Between:

Credit Hours Between:

Division:

☐ Upper Level Writing Courses  
☐ Diversity Courses

Arts, Sciences, and Engineering
Computer Science

CRN	Course	Course Title	Term	Credits	Status
49714	CSC 131	RECREATIONAL GRAPHICS	Fall 2016	4.0	Closed

**Schedule:** Day: TR    Begin: 1105    End: 1220    Building: HARK    Room: 114  
**Enrollment:** Section: 28    Enroll: 28    Section Cap: 28  
**Instructors:** PAWLICKI T  
**Prerequisites:** None  
**Description:** A hands on introduction to 3D computer graphics and animation techniques taught from a user point of view. Topics include 3D modeling, animation, and simulation. Assessment based on projects. No written exams.  
**Clusters:** N4CSC013, N4CSC014

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CRN	Course	Course Title	Term	Credits	Status
49723	CSC 161	INTRO TO PROGRAMMING	Fall 2016	4.0	Open

**Schedule:** Day: TR    Begin: 1815    End: 1930    Building: B&L    Room: 109  
**Enrollment:** Section: 32    Enroll: 115    Section Cap: 115  
**Class Info:** YOU MUST REGISTER FOR A LAB & WORKSHOP WHEN REGISTERING FOR THE MAIN SECTION.  
**Instructors:** SARKIS R; STJACQUES R  
**Prerequisites:** None  
**Description:** Organized thinking, creative problem solving, and the precise description of solutions are valuable skills in academia and life. The formulation and solution of problems using computers is increasingly important in all artistic and scholarly fields. We introduce core concepts and techniques of programming as a way to develop these skills, as basis for further CS study, and for application to other fields. Lab required.  
**Clusters:** N4CSC013, N4CSC015, N4CSC016, N4CSC017, N4CSC018, N4ECE001

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CRN	Course	Course Title	Term	Credits	Status
78686	CSC 161	INTRO TO PROGRAMMING	Fall 2016	4.0	Open

**Schedule:** Day: MW    Begin: 1650    End: 1805    Building: GRGEN    Room: 101  
**Enrollment:** Section: 53    Enroll: 115    Section Cap: 115  
**Class Info:** YOU MUST REGISTER FOR A LAB & WORKSHOP WHEN REGISTERING FOR THE MAIN SECTION.  
**Instructors:** STJACQUES R; SARKIS R  
**Prerequisites:** None

skedge
 

? CSC

2
Q
+

Choose a schedule:  
 Spring 2016

**Fall 2016**

**CSC 131: Recreational Graphics** 4 credits  
 A hands on introduction to 3D computer graphics and animation techniques taught from a user point of view. Topics include 3D modeling, animation, and simulation. Assessment based on projects. No written exams.  

**Time & Place:** Tues/Thurs 11:05am-12:20pm, HARK 114  
**Instructor:** Pawlicki T    **CRN:** 49714

28/28 enrolled

**CSC 161: Intro to Programming** 4 credits  
**Comments:** YOU MUST REGISTER FOR A LAB & WORKSHOP WHEN REGISTERING FOR THE MAIN SECTION.  
 Organized thinking, creative problem solving, and the precise description of solutions are valuable skills in academia and life. The formulation and solution of problems using computers is increasingly important in all artistic and scholarly fields. We introduce core concepts and techniques of programming as a way to develop these skills, as basis for further CS study, and for application to other fields. Lab required.  

**Time & Place:** Tues/Thurs 6:15pm-7:30pm, B&L 109  
**Instructor:** Sarkis R, St Jacques R    **CRN:** 49723

32/115 enrolled

**Time & Place:** Mon/Wed 4:50pm-6:05pm, GRGEN 101  
**Instructor:** St Jacques R, Sarkis R    **CRN:** 78686

53/115 enrolled

12
 

MTWRF

1

2

3

4

5

6

7

8

2 sections / 8 credits

feedback

Figure 1.1: CDCS (top) and Skedge (bottom) for the search query csc.

## Chapter 2

# Design as a reaction to CDCS

Improvements were made by USING CDCS, (bottom-up, not top-down)!

### 2.1 Modernity

CDCS is an old system.

#### 2.1.1 GET requests vs. AJAX

- Can use back button - Can send a link to a course or search

#### 2.1.2 Built-in scheduler vs. browser extension

- Better UX - Data is centralized

#### 2.1.3 Mobile

- Important nowadays - Mobile traffic stat or smth

#### 2.1.4 Public API

- Important nowadays, extends student possibility - JSON - Brief demo of API



## **2.2 Usability**

### **2.2.1 Data quality**

- Courses don't shout - Typos in comments - 12-hour time

### **2.2.2 Section display**

- Grouped course sections - Embedded labs (A/B too), workshops, & recitations

### **2.2.3 Course reference**

- Clickable/hoverable course links, professor searches

### **2.2.4 Multiple schedule support**

- Old CDCS+betterCDCS system can't keep track of this, have conflicts when adding stuff

### **2.2.5 Exporting to GCal, .ics, image**

- Mobile sync support - Security: BetterCDCS export gcal is currently broken and sends netID in PLAINTEXT over http(!!!)

### **2.2.6 Search**

Most important usability concern is finding courses.

## **2.3 Search**

Use cases, natural language.

### **2.3.1 Course selection criteria**

Narrowed it down to three criteria. Keep in mind that *none* of the things listed below are supported by CDCS, and they are all supported by Skedge.

## **Requirements**

- Finding crosslists - Clusters

## **Browsing**

- “New” courses - “Autofit” search - Random - Sorts

## **Friends**

- “What are my friends taking?” (“what are you taking this semester” = probably most common smalltalk phrase uttered on campus) - “What do my friends recommend?” - “have you taken this class, and if so, what did you think of it?”

### **2.3.2 Natural language search**

See figure.

## **Advantages**

- 15 fields reduced to 1
  - vs form entry: - Faster - More intuitive - More easily extendable

## **Disadvantages**

Having to know the DSL, grammar ambiguities (can be solved with a ‘did you mean’)

### **2.3.3 Multipurpose**

Used by other links (instructors, course references) around the site

### **2.3.4 Added features**

- CRN (!) - Crosslist - Class size

## **2.4 Social**

### **2.4.1 The issue**

#### **Static image vs. live site**

- Edits don't update - Referencing courses

#### **Finding common courses**

- requires your friends to share their schedules on FB publicly and you to see their post - is schedule-first, not search-first - typically only occurs for the current semester

### **2.4.2 Skedge Social**

#### **Friends' course enrollments**

Mini-feed

#### **Friends' course likes**

#### **Likes & enrollments embedded in results**

#### **Personal schedule synchronization**

#### **Privacy**

#### **Notifications**

## Chapter 3

# Technical overview

### 3.1 Back-end

### 3.2 Front-end

### 3.3 Analytics

# Chapter 4

## Data analytics

Hypotheses:

1. Skedge's differences from and additions to CDCS are usable and have real need
2. Skedge's navigations-per-add and other metrics demonstrate effectiveness of the use cases
  - a) direct searching, and b) course browsing
3. Skedge's DSL is user-friendly; users learn more advanced search types over time by using it

### 4.1 Usage

#### 4.1.1 General

Since November 3rd 2015 (137 days) 3,768 unique users 4,500 schedules Average 90 sessions/day  
Average 4.92 pages/session Average 5:31 minutes/session 28% of sessions are from new users

MOBILE RESULT

#### 4.1.2 Search

**Empty searches**

Can learn from these Some funny ones

### 4.1.3 Course blocks

40% of sessions have at least one block-click Average of 4.94 block-clicks per session

### 4.1.4 Social

90 users have linked Skedge to Facebook Since March 1st, 4,000+ visits (200 visits/day) 60% of visits to /social were returning visitors 90 overlays onto friends' schedules 10 clicks to Facebook profiles :( - get stats from the fb dashboard

### 4.1.5 Conclusion

Success! Considering skedge is OPTIONAL. + course blocks (obv usecase, can't click) + exports (not supported by thing) + mobile

## 4.2 Navigations-per-add

### 4.2.1 Definitions

A navigation is defined as a search, or a click on an instructor's name, or a click on a crosslisted or prerequisite course link

The navigations-per-add, bookmark measure is the number of navigations a user took (within one session) until a course was added, bookmarked

### 4.2.2 Trends

### 4.2.3 Breaking them apart

behavioral patterns Direct search for specific course Discovery, browsing, exploring

**Direct searches**

**Browse**

### 4.2.4 Conclusion

Effective++

## 4.3 Users' search types over time

### 4.3.1 Definitions

Points for search by (omits number and dept.):

description credits crosslisted CRN instructor title year term 'random' upper-level writing  
"CSC" 0 "MTH 165" 0 "taught by hema" 1 (2 searches) "random mur 1-2 credits" 2 (1  
search)

### 4.3.2 Trends

First increase (60.5Median: 2 searches Average: 4.23 searches (Starting at 1 counts as an increase  
value of 0)

Second increase (7.9Median: 8 searches Average: 17.52 searches

### 4.3.3 Conclusion

DSL++

## Chapter 5

# Looking forward

### 5.1 Features

### 5.2 Analytics



## Chapter 6

# Conclusions

### 6.1 Proposal to the University

### 6.2 Resources

#### Source code

The source code for Skedge is available online under an open source license:

<https://github.com/RocHack/skedge>.

#### Live site

The site can be found at: <http://skedgeur.com>.

# Bibliography

- [1] Takis Konstantopoulos *Introductory lecture notes on Markov Chains and Random Walks*.  
Uppsala University,  
<http://www2.math.uu.se/~takis/L/McRw/mcrw.pdf>

## Appendix