

**OPEN APEREO**  
100% OPEN · 100% ONLINE

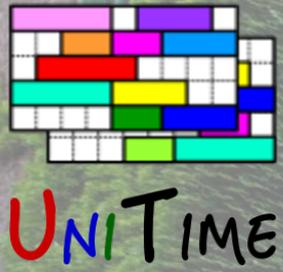
**2020**  
June 15-19

# UniTime

Comprehensive University Scheduling System

Tomáš Müller





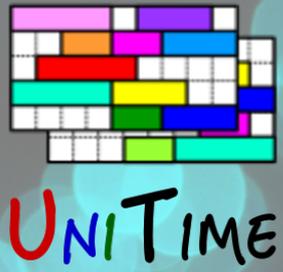
# Educational Timetabling

## What is educational timetabling?

- A process of assigning classes (or exams) in time and space
- A hard optimization problem with many (often contradictory) objectives
  - Student conflicts, faculty requirements, space constraints

## Why is it needed?

- To minimize student conflicts; students get their degree in time
- Helps to use your resources more effectively
- Makes the process easier to manage (knowledge transfer and cooperation)
- Fairness and satisfaction with the timetable
- What-if scenarios
- Ability to adapt to a change
- ...



# Introducing UniTime

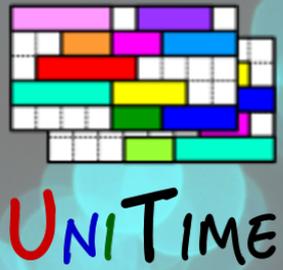
## What is UniTime?

- Comprehensive academic scheduling solution

The collage displays several key features of the UniTime system:

- Rooms:** A page showing a list of classrooms with filters for department and room type, and a map view of the campus.
- Class Detail:** A page for 'ALG 101 - Algebra I: Lec 1' showing enrollment, room, instructor, and timetable information.
- Instructional Offering Detail:** A page for 'C S 101 - Introductory Computing' showing course offerings, enrollment, and reservation options.
- Log In:** A login page for 'University Timetabling' with fields for Username and Password.
- Personal Timetable:** A page for a user named 'Root, Abraham' showing a personal view of the schedule.
- Configuration:** A page showing a table of configurations for different course types and rooms.
- Examinations:** A page for 'Examinations' showing a table of final exams with columns for classes, length, seating, size, max instructor, period, room, distribution, assigned period, and assigned room.
- Exam List:** A page showing a list of exams with search and export options.
- Student Schedule:** A page showing a student schedule for 'CHM 11600 Pso 13993-062' with a table of alternatives.





# Introducing UniTime

## What is UniTime?

- Comprehensive academic scheduling solution
- Five components

### **Courses:** time & rooms

- time preferences
- room requirements
- availability
- course structure
- avoid time clashes

### **Events:** room bookings

- course-related events
- personal schedule
- approval process
- unavailabilities

### **Exams:** period & rooms

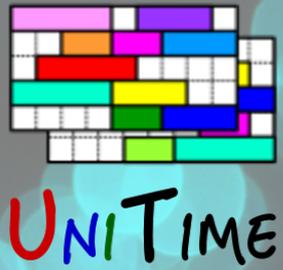
- minimize student conflicts
- period & room prefs
- distributions
- room sharing

### **Instructors:** teaching assignments

- teaching load
- qualifications / skills
- preferences
- course spreading

### **Students:** class schedule

- course requirements
- alternatives / free times
- reservations
- section balancing
- schedule quality



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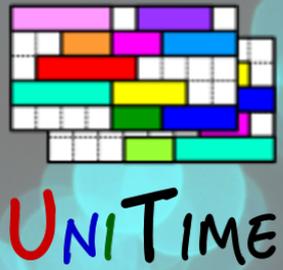
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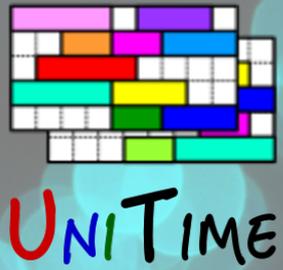
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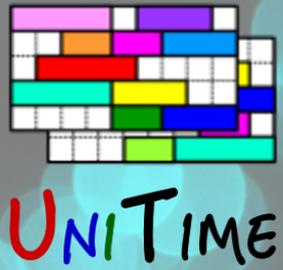
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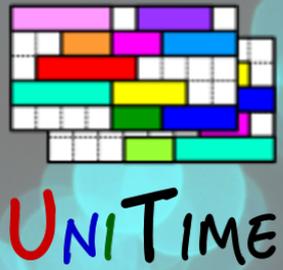
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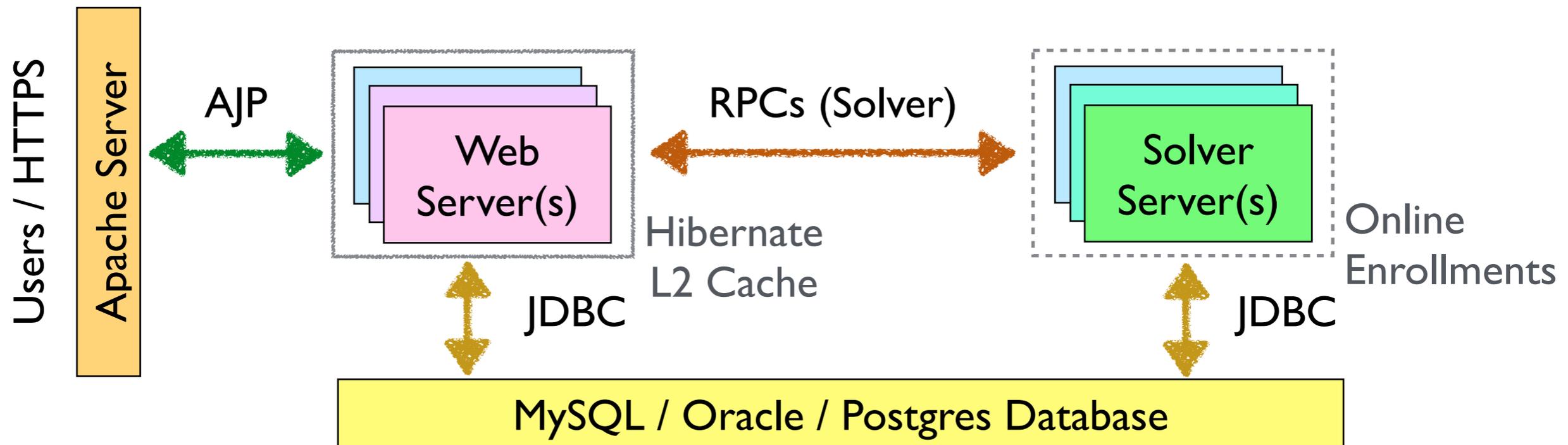
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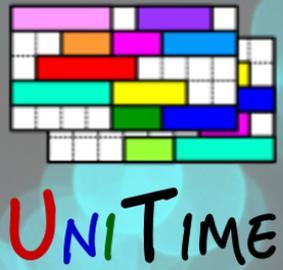


# Introducing UniTime

## What is UniTime?

- Comprehensive academic scheduling solution
- Five components: course timetabling, examination timetabling, student scheduling, instructor scheduling, and event management
- Open Source, web-based, written in Java using modern technologies





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## What is UniTime?

- Comprehensive academic scheduling solution
- Five components: course timetabling, examination timetabling, student scheduling, instructor scheduling, and event management
- Open Source, web-based, written in Java using modern technologies
- Using state of the art optimization algorithms

PURDUE  
UNIVERSITY



International  
Timetabling  
Competition 2019



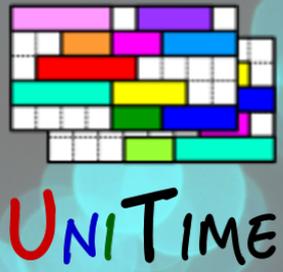
UNIVERSIDAD  
YACHAY  
TECH



### ITC 2019

- course timetabling with students
- 3 sets of problems (10 each)
- 200+ registrations
- 12 solvers
- 2 milestones
- 5 finalists

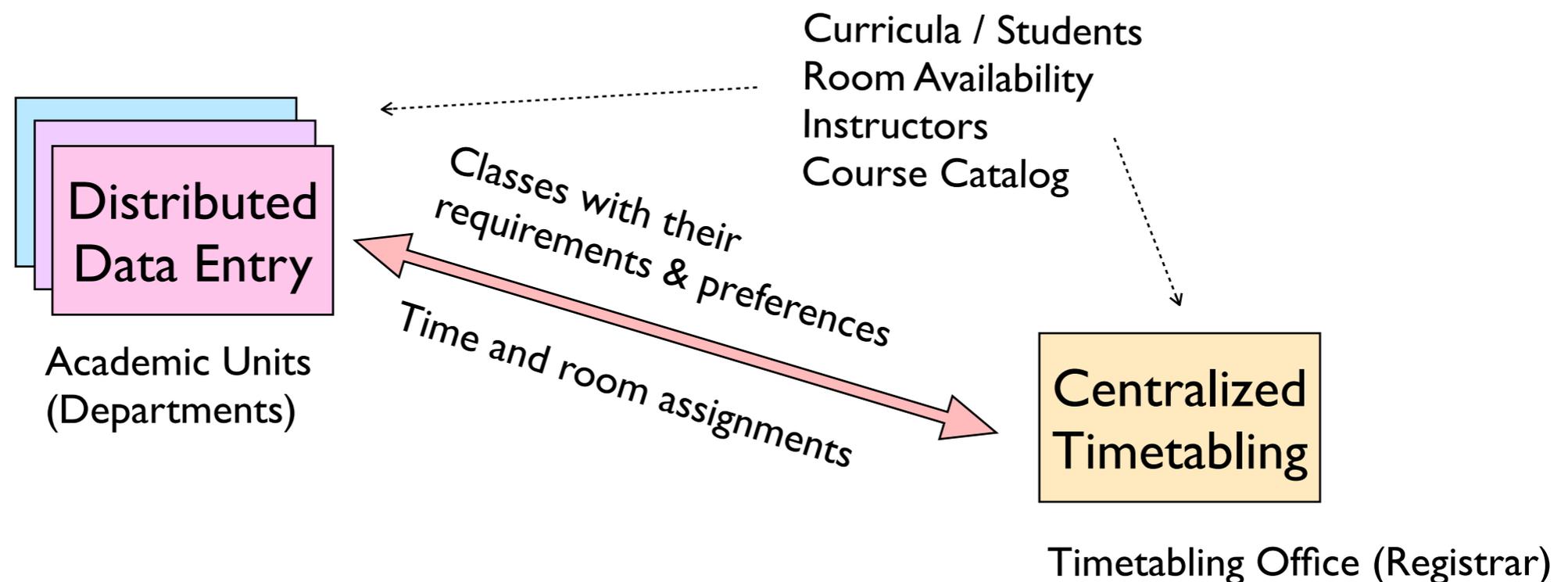
<https://www.itc2019.org>

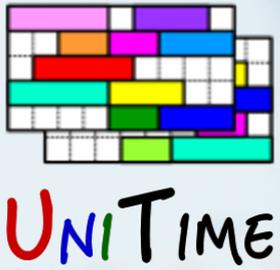


# Introducing UniTime

## What is UniTime?

- Comprehensive academic scheduling solution
- Five components: course timetabling, examination timetabling, student scheduling, instructor scheduling, and event management
- Open Source, web-based, written in Java using modern technologies
- Using state of the art optimization algorithms
- **Distributed data entry and timetabling in a multi-user environment**



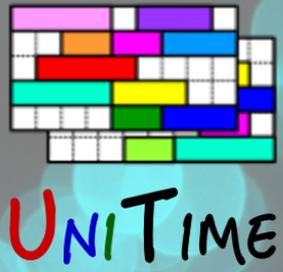


# UniTime Users

## World cloud

- All voluntary registrations
- 75 institutions have indicated that they use UniTime in production
- 50 new registrations during the last 12 months (10 production)
- 10 institutions from 4 continents has provided data for the ITC 2019 competition

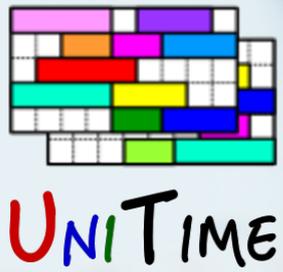




# UniTime Releases

## UniTime Versions

- One major release each year (UniTime 4.4 is our current production)
  - Minor releases on bi-monthly bases or as needed
- Next release: UniTime 4.5, later this year
  - Pre-registration & batch scheduling, advisor support
  - Improvements in re-scheduling (due to COVID)
  - Dozens of small improvements across all the components
- Future Development
  - Student scheduling - automated waitlisting



# New: Advisor Support

## Student Scheduling (now with advisor support)

### I. Student meets with the advisor

- Fill in Advisor Recommendations (using degree plan, etc.)
- Alternative and substitute courses, section pre-assignments
- Placeholders & additional notes (e.g., foreign language 3 credits)
- PDF confirmation

**Advisor Course Recommendations**

Muller, Tomas Administrator Session: Fall 2020 (PWL) [Click here to change the session.](#)

Send email confirmation

Degree Plan

Student's Name: Student, Joe Id: 27048142  
 Advisor/Email: muller@purdue.edu Term: Fall 2020 (PWL)  
 Status: TEST: All Enabled

**Student Course Requests**

Priority	Course	Title	Credit	Requested
1. Priority	CS 18000BLK	Prob Solving & O-O Programming	4	06/11/2020
2. Priority	CS 19100	Freshm Resources Semnr	1	06/11/2020
3. Priority	CS 19300	Tools	1	06/11/2020

**Advisor Course Recommendations**

Priority	Course	Credit Hours	Notes
1. Priority	PHIL 26000	3 - 4	Enter these as alternatives on your course request form to ensure you get a written communication course.
1. Alternative	SCLA 10100		
2. Alternative	ENGL 10800		
3. Alternative	ENGL 10600		
2. Priority	MA 16100	3 - 5	
1. Alternative	MA 16010		
3. Priority	ITAL 10100	3	Select one of these to begin work on your foreign language requirement.
1. Alternative	GER 10100		
2. Alternative	SPAN 10100		
4. Priority	Enter a course name, e.g., ENG 10600		
5. Priority	or a free time, e.g., Free MWF 7:30 - 8:30		
6. Priority			
7. Priority			
8. Priority			
9. Priority	Course with the lowest priority.		

Total Priority Credit Hours: 9 - 12

**Substitute Advisor Course Recommendations** (used only if a course requested above is not available)

1. Substitute	HIST 10300	3	
2. Substitute			

Additional Notes: Your student registration PIN is 999999. You will need this if you decide to make changes to your course schedule once you have been registered.

Send email confirmation

**PURDUE UNIVERSITY** **Advisor Course Recommendations**

Student's Name: Student, Joe Id: 27048142  
 Advisor/Email: muller@purdue.edu Term: Fall 2020 (PWL)  
 Status: TEST: All Enabled

**Advisor Course Recommendations**

Priority	Course	Credit	Notes
1. Priority	PHIL 26000 Philosophy And Law	3 - 4	Enter these as alternatives on your course request form to ensure you get a written communication course.
1. Alternative	SCLA 10100 Crit Think & Com I		
2. Alternative	ENGL 10800 Acad First-Yr Compos		
3. Alternative	ENGL 10600 First-Year Composition		
2. Priority	MA 16100 11458-960 - Ft Any Geo Calc I	3 - 5	
1. Alternative	MA 16010 18135-038 - Applied Calculus I		
3. Priority	ITAL 10100 Italian Level I	3	Select one of these to begin work on your foreign language requirement.
1. Alternative	GER 10100 German Level I		
2. Alternative	SPAN 10100 Spanish Level I		

Total Priority Credit Hours: 9 - 12

**Substitute Advisor Course Recommendations** (used only if a course requested above is not available)

1. Priority	HIST 10300 Intro To Medieval Wld	3	
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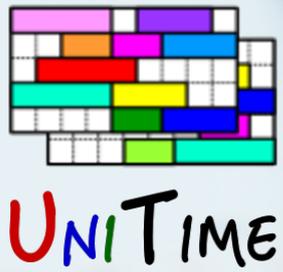
Your student registration PIN is 999999. You will need this if you decide to make changes to your course schedule once you have been registered.

Advisor's Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Student's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Students are responsible for meeting course prerequisites and fulfilling degree requirements, and are ultimately responsible for their own educational plan and academic success.

06/11/2020 06:29PM UniTime 4.5.7. © 2008 - 2020 The Apereo Foundation, distributed under the Apache License.





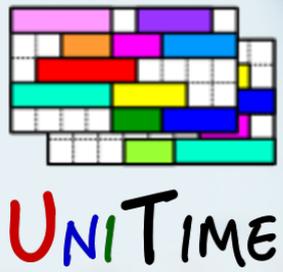
# New: Advisor Support

## Student Scheduling (now with advisor support)

1. Student meets with the advisor
2. Student fills in pre-registration

The screenshot shows the 'Student Course Requests' page. At the top, it displays the UNI TIME logo, the user name 'Student, Joe', and the session 'Fall 2020 (PWL)'. There are tabs for 'Degree Plan', 'Advisor Recommendations', and 'Current Registration', with a 'Submit Requests' button. The main section is titled 'Course Requests' and contains a list of 12 priority requests. Each request includes a course ID, a priority level, and a status indicator (checkmark or 'X'). Some requests have alternative courses listed below them. For example, Priority 4 is PHIL 26000 with alternatives SCLA 10100, ENGL 10800, and ENGL 10600. Priority 5 is MA 16100 with alternative MA 16010. Priority 6 is ITAL 10100 with alternatives GER 10100 and SPAN 10100. At the bottom, there is a 'Substitute Course Requests' section with three entries, the first being HIST 10300. A yellow warning banner at the bottom states: 'You have made some changes in your course requests. Please click the Submit Requests button to update your submission.'

- Pre-populated with advisor recommendations, but can make additional changes
- Request approvals (e.g., pre-requisite overrides, departmental permissions)
- May include free time requests and preferences



# New: Advisor Support

## Student Scheduling (now with advisor support)

1. Student meets with the advisor
2. Student fills in pre-registration
3. Schedule is built for all pre-reg students
  - Nightly test runs to detect conflicts & demand issues early
  - Critical courses have higher priority

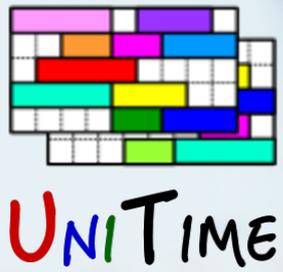
Filter: UC01 x ▼ X Search Export More ▼

Enrollments **Students**

Subject Type	Course CRN-SectionId	Title	Consent Date Room	Available	Projection	Snapshot Limit	Enrollment	Not-Enrolled	Alternative	Reservation	Need Consent	Need Override
+	SCLA 10100			10 / 310	-	930	290	38	98	10	-	-
+	ENGL 10600INTL			0 / 159	-	180	159	7	-	-	-	-
+	PHIL 26000			0 / 150	-	150	150	2	47	-	-	-
+	ENGL 10600			0 / 86	-	700	86	69	77	-	-	-
+	ENGL 10600DIST			0 / 80	-	320	80	2	64	-	-	-
+	COM 20400			16 / 90	-	144	74	-	-	1	-	-
+	ENGL 10800			0 / 70	-	380	70	10	93	-	-	-
+	ENGL 10600LCOM			51 <sup>r)</sup> / 120	-	120	69	1	-	69	-	-
+	EDCI 20500			91 + 10 <sup>w)</sup> / 152	-	154	51	-	-	12	-	-
+	AMST 10100			0 / 46	-	46	46	2	41	-	-	-
+	HONR 19903			0 / 20	-	20	20	7	2	2	-	-
<b>Total</b>				<b>1268 / 1351</b>			<b>1095</b>	<b>138</b>	<b>422</b>	<b>94</b>	<b>-</b>	<b>-</b>

r) Space available only with a reservation.  
w) Wait-listed requests.





# New: Advisor Support

## Student Scheduling (*now with advisor support*)

1. Student meets with the advisor
2. Student fills in pre-registration
3. Schedule is built for all pre-reg students
4. Students review their schedule, make changes, additional approvals
  - Students that do not pre-register, skip steps 2 and 3
  - Can still make use of advisor recommendations (pre-populated courses)

Student Scheduling Assistant

User: Student, Joe    Session: Fall 2020 (PWL)

Buttons: Add/Drop Courses, Rearrange Schedule, Current Registration, Submit Schedule, Export PDF

Class Schedule

Lock	Subject	Course	Type	Class	Avail	Days	Start	End	Date	Room	Instructor	Requires	Note	Credit
	CS	18000BLK	Lec	10687-BLK	287 / 288	MWF	11:30a	12:20p	08/24 - 12/11	CL50 224		Waiting for consent of department	Supplemental Instruction (SI) st... Students registering for this cou...	4
			Lab	22689-LC1	23 / 24	W	3:30p	5:20p	08/26 - 12/09	HAAS G056		10687-BLK	Supplemental Instruction (SI) st...	✓
	CS	19100	Lec (Hybrid)	24515-LC1	71 / 72	F	2:30p	3:20p	08/28 - 10/16	HIKS G980D	L J Obrien, P M Leblanc	Waiting for consent of department	Students registering for this cou...	1
			Dist (Hybrid)	24527-D01	719 / 720	Arrange Hours			08/24 - 10/20		L J Obrien, K B Jones	Waiting for consent of department	Students registering for this cou...	✓
	CS	19300	Lec	24530-LE2	191 / 192	T	8:30a	9:20a	08/25 - 12/08	SMTH 108	S M Thomas, A J Smith	Waiting for consent of department	24530-LE2	1
			Pso	24536-PO3	95 / 96	M	2:30p	3:20p	08/24 - 12/07	MSEE B012				✓
	PHIL	26000	Lec	20280-007	149 / 150	TR	3:30p	4:20p	08/25 - 12/10	LILY 1105	L Parrish			3
			Rec	20273-002	24 / 25	F	9:30a	10:20a	08/28 - 12/11	BRNG 1230				✓
	MA	16100	Lec	11458-960	119 / 120	T	10:30a	11:45a	08/25 - 12/08	WALC 2087	J R Peterson		Supplemental Instruction (SI) st... Evening Exams Required. Prere... Supplemental Instruction (SI) st...	5
			Rec	11474-965	39 / 40	WF	1:30p	2:20p	08/26 - 12/11	REC 113		11458-960	Supplemental Instruction (SI) st... Evening Exams Required. Prere... Supplemental Instruction (SI) st...	✓
			Ind	11478-IMA	119 / 120	Arrange Hours			08/24 - 12/12		J R Peterson	11458-960	Supplemental Instruction (SI) st... Evening Exams Required. Prere...	✓
	ITAL	10100	Lec	17028-002	19 / 20	MWF	12:30p	1:20p	08/24 - 12/11	SC G014	G Grande			3

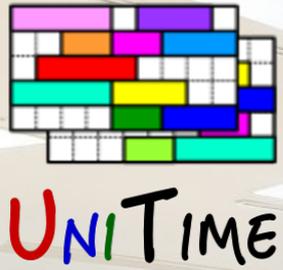
Total Credit: 17

Buttons: Add/Drop Courses, Rearrange Schedule, Current Registration, Submit Schedule, Export PDF



- Implemented at Purdue starting Fall 2020 registration
- Advisor course recommendations filled in for over 9,600 students





# Re-Scheduling at Purdue

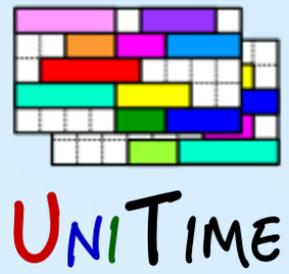
## Schedule changes for Fall 2020 at Purdue

- Purdue will resume in-person classes in Fall
- Some courses/classes will be moved online
- Room capacity reduced to ~50% to improve social distancing
- Options: keep as is, find larger room, add sections, alternate attendance

## UniTime

- New room capacities
- New sections added (where applicable)
- Room requirements updated
- Course timetabling re-done using fixed-time MPP
- Continuing students re-batched together with incoming students
  - Students will keep the courses they were already enrolled in
  - Preferences set to keep as many sections as possible
- Students will be able to make changes after the new schedules are published





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100% OPEN · 100% ONLINE

**2020**  
June 15-19

**Thank you!**

**Tomáš Müller**

muller@unitime.org

Purdue University

More about UniTime: Using UniTime to improve institutional efficiency  
on Wednesday at 9:10 AM EST / 3:10 PM CEST

For more details about UniTime, see <https://www.unitime.org>

