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Article



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AUTOMATION SYSTEM FOR GENERATING UNIVERSITY COURSES

Abstract: A system is described that allows us to create, using curriculum and class schedules, a set of courses in LMS Moodle and commands for webinars, and synchronizes them with each other. Students and teachers can go to the corresponding Moodle course from the scheduling web form, and from there to the desired webinar.

Key words: IT infrastructure of SPbPU, integration, PHP, Python, Celery, Django, Moodle, MS Teams, MTS Link, Webinar.ru.

Language: English

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Introduction

This work continues the series of articles [1-4], describing the latest development of the IT infrastructure of SPbPU.

SPbPU is one of the largest universities in Russia - currently about 30,000 students study there and about 2,000 teachers work there [5], it is among the top 5 universities in Russia in terms of the number of budget places [6]. Although training sessions are conducted in classrooms in person, for each training course a course is created in the LMS Moodle system, where teachers must post training materials for their classes. Every semester you need to create about 10,000 courses on a dozen distance learning portals of all SPbPU institutes. Next, for each training course you need to be able to create a video conference (for each lesson). Until recently, SPbPU used MS Teams for its classes, currently also used MTS Link (ex Webinar.ru). Therefore, a class team is created in MS Teams for each teacher and group. In addition, each such course and team must have a link in the online schedule so that teachers and students can access it. In addition, the corresponding LMS Moodle system course and team from MS Teams must have users

corresponding to this group and this teacher - i.e. user synchronization is also needed. The presence of such courses and teams is also necessary to be able to transfer any discipline to a distance learning format. And it is clear that without automating the process it is completely impossible to do all this. In this article we will look at the system for creating such courses and teams.

Formulation of the problem

SPbPU has a scheduling system based on the Galaktika system [7], which has a web interface for searching the schedule of groups and teachers. Fig. 1 shows an example of displaying part of a teacher's schedule, where each cell of the schedule for a given teacher indicates the time of the lesson, subject, type of lesson (lecture, practical lesson or laboratory lesson), group (or group learning stream for lectures), audience and link to the corresponding course in the LMS Moodle system for this pair (the link is designated as "CДO"). How is such a link created?

For this purpose, we created an API consisting of 7 scripts (web applications), combined into 3 logical groups. First of all, it should be noted that there

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are 3 forms of generating courses - subject (special subjects for the corresponding educational institute of SPbPU), general education (lectures, practical lessons or laboratory lessons), foreign language (there is a feature with subgroups). Fig. 2 shows the generation of courses with the choice of one of the three types of disciplines described above, Fig. 3 shows the choice of the form of training for which the course is generated. The required courses are taken from educational plans, information from which is entered into the Galaktika database. One of our scripts accesses the Galaktika and collects data in JSON format [8], which it transfers to the database of the API we created. Therefore, we know which courses need to be generated – Fig. 4 shows a button for obtaining a list of courses required for generation (for a given course type) and part of the resulting list of courses. Next, we can receive JSON for generating the course (by clicking the appropriate button – Fig. 5), it can be edited if desired (Fig. 6) and then sent for generation (by clicking the appropriate button – Fig. 7). The course is created in accordance with a given structure, its content is specified programmatically. The result of the generation (successfully) is also shown in Figure 7, and we can see the generated course in the list of created courses (Fig. 8). Fig. 9 shows the classes that should be conducted with students within the course for which this course was generated (information about this in the form of corresponding timeslots was taken by our script from the Galaktika database). After our scripts have collected all the necessary data for the created course, it can be created in Moodle (Fig. 10). As a result, the course appears in the corresponding Moodle section (Fig. 11). After the course is generated, the necessary link is created in the schedule web form for the created course. Next, you need to create an appropriate room for webinars in MS Teams [9] and MTS Link (ex Webinar.ru) [10] (these are 2 video conferencing platforms currently used in SPbPU). This is done by our two scripts (API-teams and API-webinar, respectively) written in Python using Celery [11] (Fig.

12). After this, the script adds a link to the created MS Teams / MTS Link team to the corresponding Moodle course (the link is highlighted in Figure 13). A separate script synchronizes the Moodle course and teams in MS Teams / MTS Link - for this, a list of all the necessary students is taken from the corresponding timeslots, and they are added both to the Moodle course and to the teams in MS Teams / MTS Link.

Conclusion

As a result, we created a system for automating the generation of courses in Moodle, as well as webinar rooms, which are synchronized with each other and also synchronized with the web interface of the class schedule. When creating this system, we used PHP, Python, Celery, Django [12]. Adding a new video conferencing platform to our system if necessary is not difficult - currently, the Teams API is used to work with MS Teams, and our system also works with MTS Link (Webinar.ru). This system centralizes the creation of courses and streamlines work in webinars. You can find out whether the teacher taught classes online, and if he independently edits the webinars, then whether they are available to students.

This system is also easily scalable if desired. Thanks to this already working system, we create about 10,000 courses every semester that our students and teachers use. Moreover, the system allows you to create courses not only for the administrator, but also for those responsible at the institutes for the electronic educational system. The system allows you to place courses not on one specific distance learning site, but in accordance with the rules of the institute or the type of course on different sites. Modifications to the modules allow synchronization to be carried out in accordance with the internal rules of SPbPU, and not to use the system according to Microsoft logic.

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Поиск

по группе по преподавателю

Кожевников Вадим Андреевич

Расписание с 16 октября по 22 октября (чётная неделя)

Печать iCal Сетка

Предыдущая неделя 16 10 - 22 10 Следующая неделя

16 окт., пн

10:00-11:40 **Физика**
Лекции
Поток показать группы
Кожевников Вадим Андреевич
СДО
Главное здание, ауд_283

12:00-13:40 **Физика**
Лабораторные
5030103/20001 п/г 1 показать группы
Кожевников Вадим Андреевич
СДО
Главное здание, ауд_285

ps://lms.spbstu.ru/course/view.php?id=16567 5:40 **Физика**

Fig 1. Class schedule cell

Генерация курсов и Teams

Получить дисциплину из расписания Получить все дисциплины без ссылок Создать курсы + Teams Созданные курсы

Генератор не созданных курсов

Введите институт
ФизМех

Форма обучения
Очная

Тип дисциплин
Курсы института
Курсы института
Общеобразовательные
Иностранный язык
доп.сессия, зачет
Доп.сессия. Зачет с оценкой
Доп.сессия. Курсовая работа
Доп.сессия. Курсовой проект
Зачет

Fig 2. Course generation taking into account the type of disciplines

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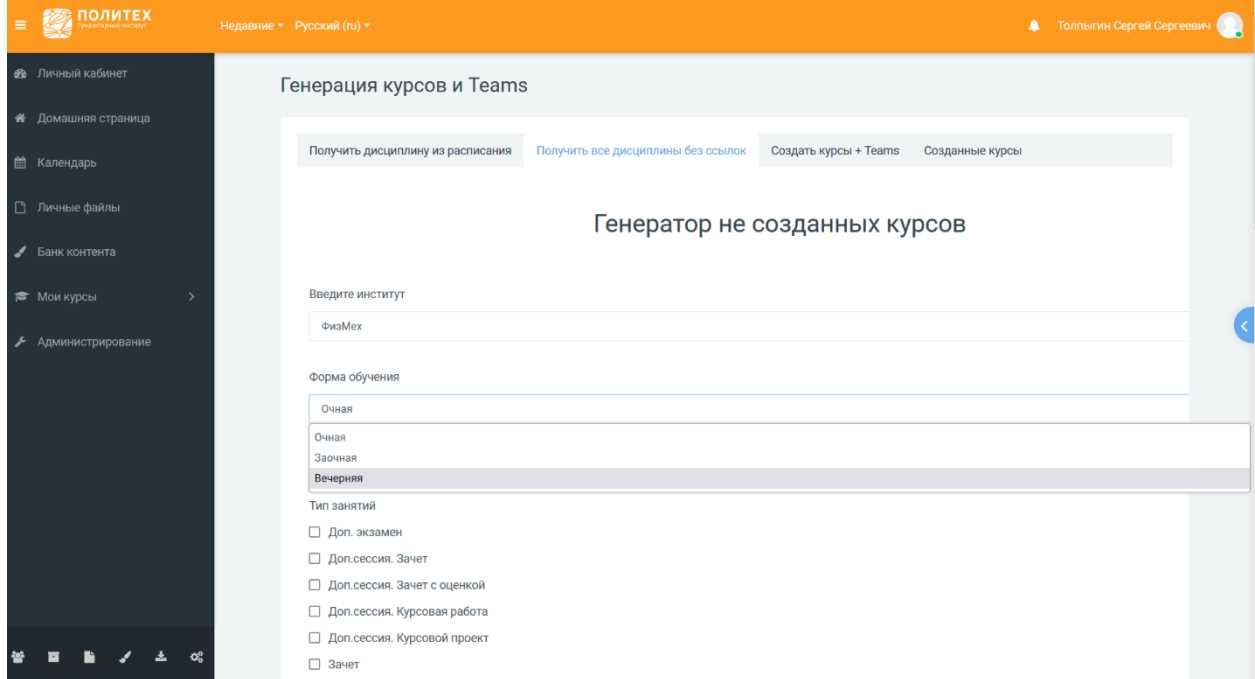


Fig 3. Course generation taking into account the choice of form of training

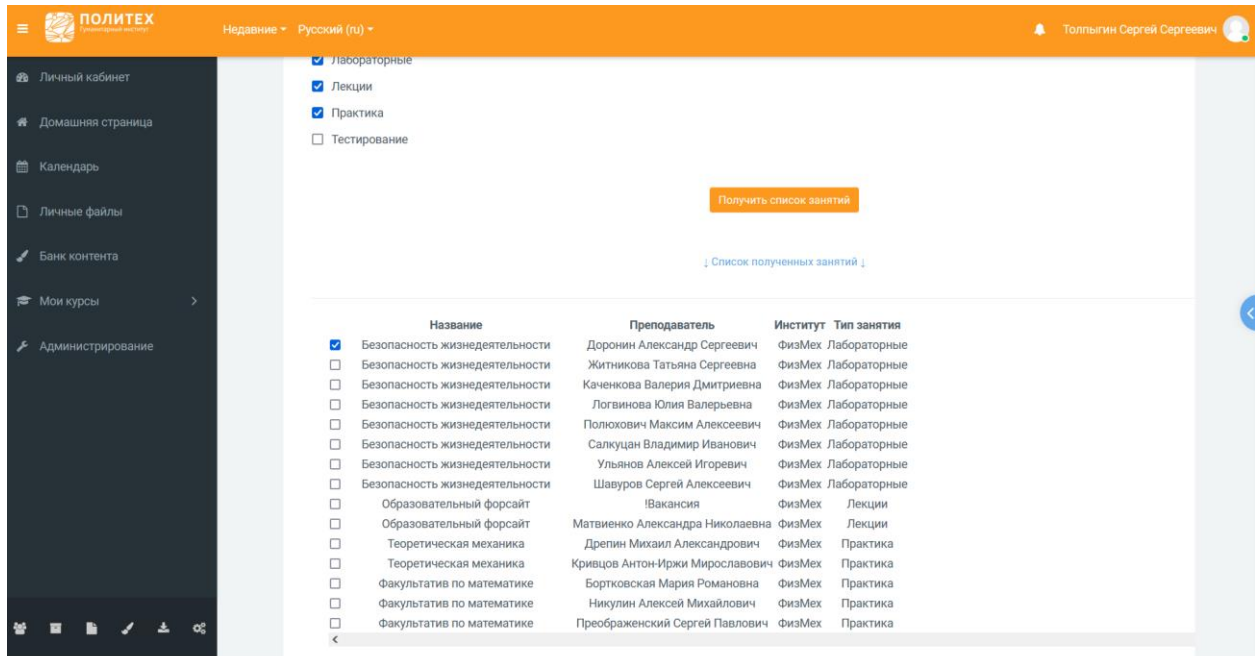


Fig 4. List of lessons received

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The screenshot shows the POLITECH interface with a sidebar on the left containing navigation options like 'Личный кабинет', 'Домашняя страница', 'Календарь', etc. The main area displays a list of course items with columns for checkboxes, subject names (e.g., 'Физика'), instructor names (e.g., 'Романов Владимир Викторович'), and course types (e.g., 'ФизМех Практика'). Below the list is a button labeled 'Получить JSON для генерации' and a link for the generated JSON.

Fig 5. Getting JSON to generate

The screenshot shows the POLITECH interface with a sidebar on the left. The main area displays a JSON editor with a text area containing a JSON object for a lesson. The JSON includes fields for 'id', 'profiles', 'kinds_of_work', 'employee', 'sch_contentofload_oid', 'subgroups', and 'schedule'. The 'employee' field is populated with 'Иовановски Ненад'.

Fig 6. Ability to edit JSON if desired

The screenshot shows the POLITECH interface with a sidebar on the left. The main area displays a JSON object for a lesson, similar to the one in Fig 6. Below the JSON is a button labeled 'Отправить на генерацию' and a link for the result. At the bottom, there is a confirmation message: 'Алгоритмизация и программирование | Иовановски Ненад | ОК'.

Fig 7. Sending JSON to generate a course

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The screenshot shows the Django administration interface for course management. The page title is "Django administration" and the breadcrumb is "Home > Courses > Disciplines". The main heading is "Select discipline to change" with an "ADD DISCIPLINE +" button. Below this is an "Action:" dropdown menu and a "Go" button, with "0 of 100 selected" displayed. A list of 15 courses is shown, each with a checkbox and a label. The courses include "Алгоритмизация и программирование Йовановски Ненад in 51 for BACHELOR", "Математические методы управления перевозками (а) Попова Ольга Валентиновна in 33 for MASTER", "Научный дискурс (а) Ефанов Дмитрий Викторович in 33 for MASTER", "Логистика (а) Плотников Дмитрий Георгиевич in 33 for MASTER", "История и методология науки (а) Ефанов Дмитрий Викторович in 33 for MASTER", "Иностранный язык в профессиональной коммуникации, Английский (а) Дмитриева Наталья Владимировна in 33 for MASTER", "Документационное сопровождение логистической деятельности (а) Баните Аушра Владовна in 33 for MASTER", "Учебная практика (а) Синявина Мария Павловна in 37 for MASTER", "Производственная практика (а) Темиргалиев Егор Рианович in 37 for MASTER", "Преддипломная практика (а) Синявина Мария Павловна in 37 for BACHELOR", "Научно-исследовательская работа (а) Танина Анна Валерьевна in 37 for MASTER", "Научно-исследовательская практика (а) Леонтьев Дмитрий Николаевич in 37 for MASTER", and "Карьерная адаптивность (а) Надежина Ольга Сергеевна in 37 for MASTER".

Fig 8. List of generated courses

The screenshot shows the Django administration interface for timeslot management. The page title is "Django administration" and the breadcrumb is "Home > Courses > Timeslots". The main heading is "Select timeslot to change" with an "ADD TIMESLOT +" button. Below this is an "Action:" dropdown menu and a "Go" button, with "0 of 100 selected" displayed. A list of 15 timeslots is shown, each with a checkbox and a label. The timeslots are for "Lesson Лабораторные of Алгоритмизация и программирование Йовановски Ненад in 51 for BACHELOR with Йовановски Ненад (20992 / jovanovskl_n@spbstu.ru)" and range from 2023-11-27 08:00:00+00:00 to 2023-11-27 09:40:00+00:00 to 2023-11-06 13:40:00+00:00.

Fig 9. Timeslots for the created course

The screenshot shows the Moodle interface for course generation. The page title is "Генерация курсов и Teams". The main heading is "Список дисциплин без курсов на moodle" with "Всего: 1" below it. A list of 1 course is shown, with "Алгоритмизация и программирование Йовановски Ненад" selected. Below the list is a button "Сгенерировать выбранные курсы на moodle".

Fig 10. Generating a course in Moodle

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The screenshot shows a Moodle course page. At the top, it displays the course title '02.03.03 Математическое обеспечение и администрирование информационных систем' and the user 'Толпыгин Сергей Сергеевич'. Below the title, there are navigation links: 'Личный кабинет / Курсы / Учебный год 2023/24, осенний семестр / Бакалавриат / 02.03.03 Математическое обеспечение и администрирование информационных систем'. There are buttons for 'Добавить курс', 'Управление курсами', and a settings icon. Below these are filters for 'Учебный год 2023/24, осени', 'Без сортировки', and a search box. The main content area shows a list of courses under the heading 'Курсы'. Four course cards are visible, each with an icon, title, and instructor name: 1. 'Алгоритмизация и программирование' by Иовановски Ненад; 2. 'Программирование баз данных' by Сабинин Олег Юрьевич; 3. 'Системы реального времени' by Вербова Наталья Михайловна; 4. 'Методы кодирования данных' by Пак Вадим Геннадьевич.

Fig 11. The created course in the corresponding section of Moodle

The screenshot shows a Django REST framework API endpoint. The browser address bar shows 'api.open.spbstu.ru/api/intermediate_courses/73811/provide/'. The page title is 'Discipline Course' with 'OPTIONS' and 'GET' buttons. The endpoint is 'GET /api/intermediate_courses/73811/provide/'. The response is a JSON object:

```
HTTP 200 OK
Allow: GET, HEAD, OPTIONS
Content-Type: application/json
Vary: Accept

{
  "discipline": {
    "id": 73811,
    "education_level": "Бакалавриат",
    "external_id": "f4f98b2c174f65875a28448243c525be",
    "name": "Алгоритмизация и программирование Иовановски Ненад",
    "institute_code": 51
  },
  "portal": {
    "id": 8,
    "name": "ИЖК",
    "url": "https://dl.spbstu.ru/",
    "institute_code": 51,
    "ignore_ssl_errors": false,
    "root_category": 1,
    "full_name": "ИЖК"
  },
  "course_link": "https://dl.spbstu.ru/course/view.php?id=5435",
  "internal_id": 5435,
  "internal_category_id": 305,
  "created_at": "2023-10-19T13:51:23.855347Z"
}
```

Fig 12. Creating a team using API-teams

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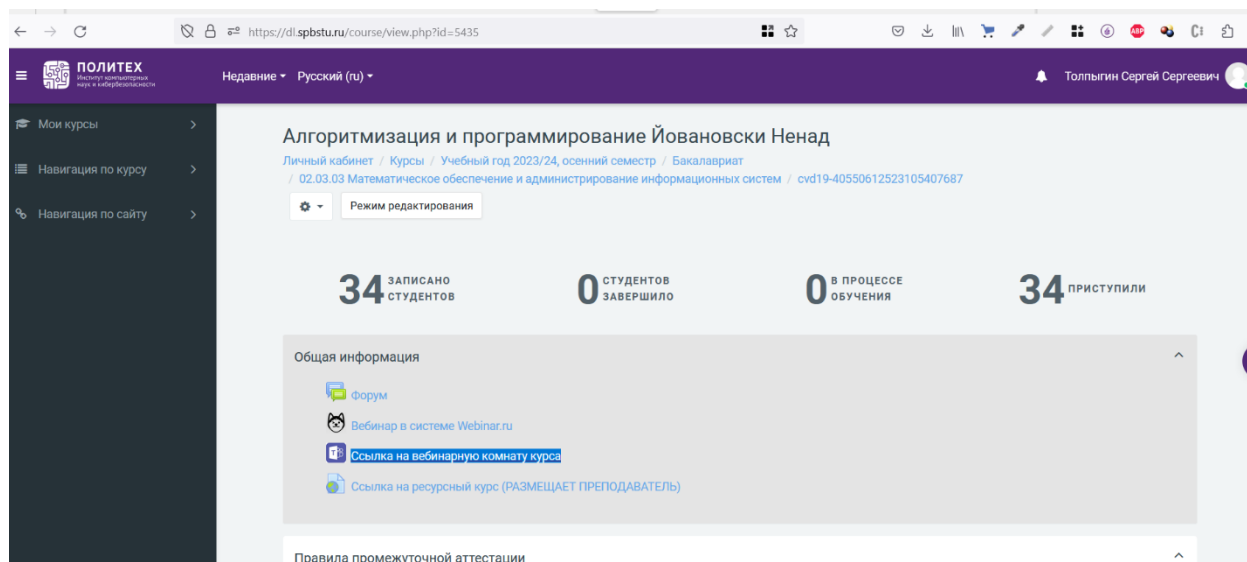


Fig 13. Link to MS Teams in the corresponding Moodle course

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