Innopolis University

SYSTEM AND NETWORKING ENGINEERING

LABORATORY REPORT 1

Wiki, XML, CSS

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Contents

1 Introduction

Knowledge about technologies as Wiki, XML, and CSS is the fundamentals of computer science. These topics play a key role in the later courses. So I should learn how all these things work.

Lab work consists of three assignments:

1. Wiki
2. XML
3. CSS/XSLT

2 Main Part

2.1 Wiki

1. Install to machine some Wiki engine
I had to select the Wiki engine. My first choice fell on *Sakai*, but after *Sakai* began to deploy, I realized that I needed a simpler Wiki engine. So I started to deploy the **DokuWiki** engine because it's easy to configure. On the Internet, I found the installation instructions for **DokuWiki** on Ubuntu.
Steps:

   (a) Installed **Apache2** and **PHP**

   (b) Downloaded and uncompressed the latest stable release of **Dokuwiki**

   (c) Changed the Apache configuration files

   (d) Started up the page **install.php** in local host (IP-address: **188.130.155.46**)

   (e) Installed the initial settings on the page

   (f) Installed the sendmail program **postfix**

2. Organize it in such a way it is easy to navigate through

   (a) For a better view, I set a template for my site and added logo

   (b) On the start page, I created an ordered list, in which each item has a link to the other pages (Figure 1)
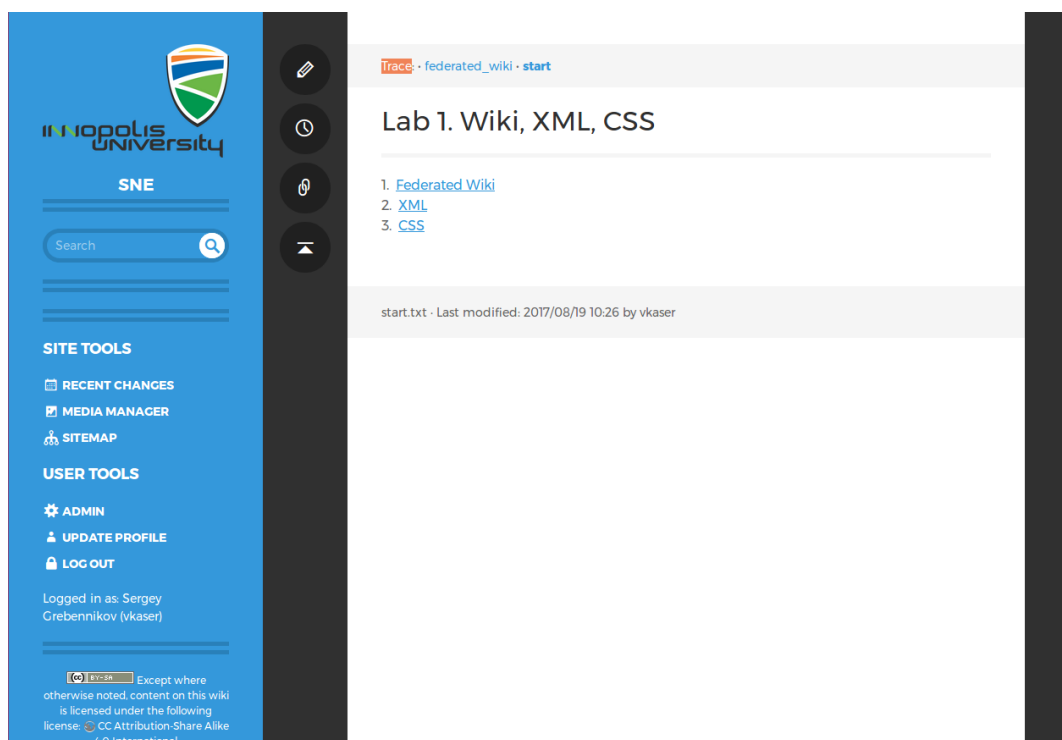

Figure 1: The start page

   (c) The first item in the list refers to the topic of the Federated Wiki. Other items refer to the following assignments of Lab (Figure 2)
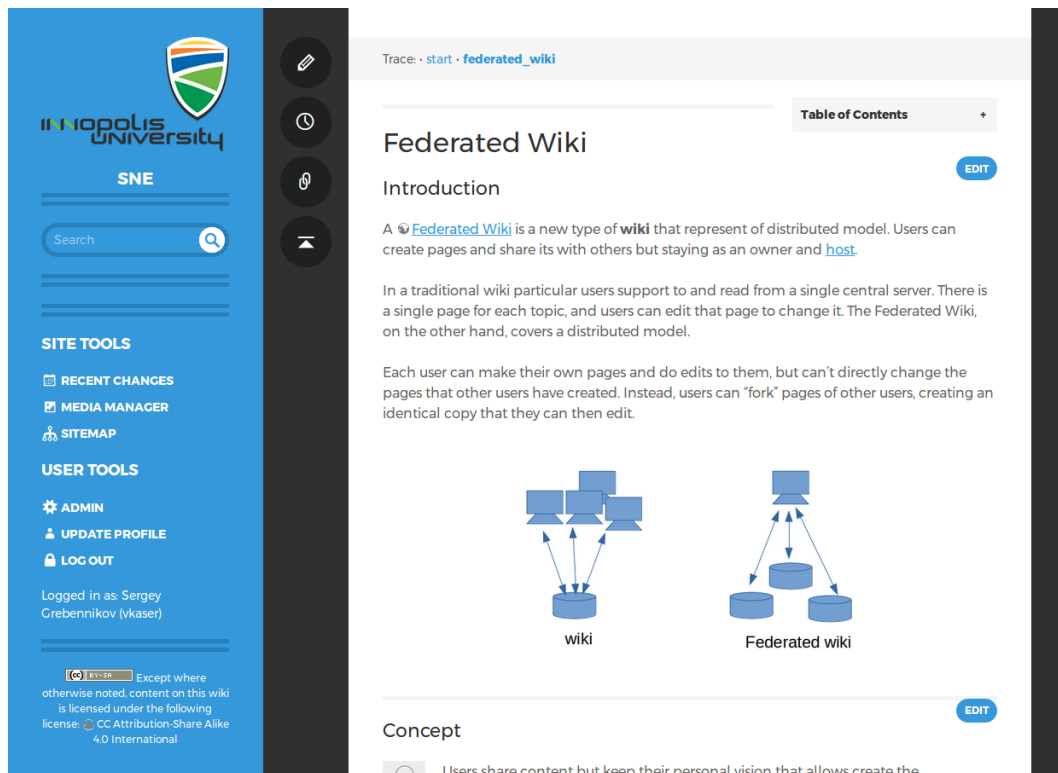
Figure 2: The Federated Wiki

2.2 XML

1. Create few entities that are related to each other (nested) that can uniquely identify by characteristics

   (a) As a subject area, I chose the educational program of the Innopolis University

   (b) The root element is **innopolis** (Figure 3)

   (c) Entered data for elements

2. Create a DTD

   (a) Using the DTD, I described all the elements and attributes (Figure 4)

3. Create a XML schema

   (a) Using XML schema, I separately described simple elements (Figure 5), complex elements (Figure 6), attributes (Figure 7), and restrictions(Figure 8)

4. Validate the data against both schemas

   (a) Using the online validator, I checked both schemas DTD (Figure 9) and XSD (Figure 10)

2.3 CSS/XSLT

1. Write an XSLT stylesheet that transforms the XML data to valid XHTML **strict**, which can be viewed from within a browser

   (a) Using the **DOCTYPE** declaration in the XSLT file I put in an instruction to the web browser that my page has a strict format XHTML (Figure 11)
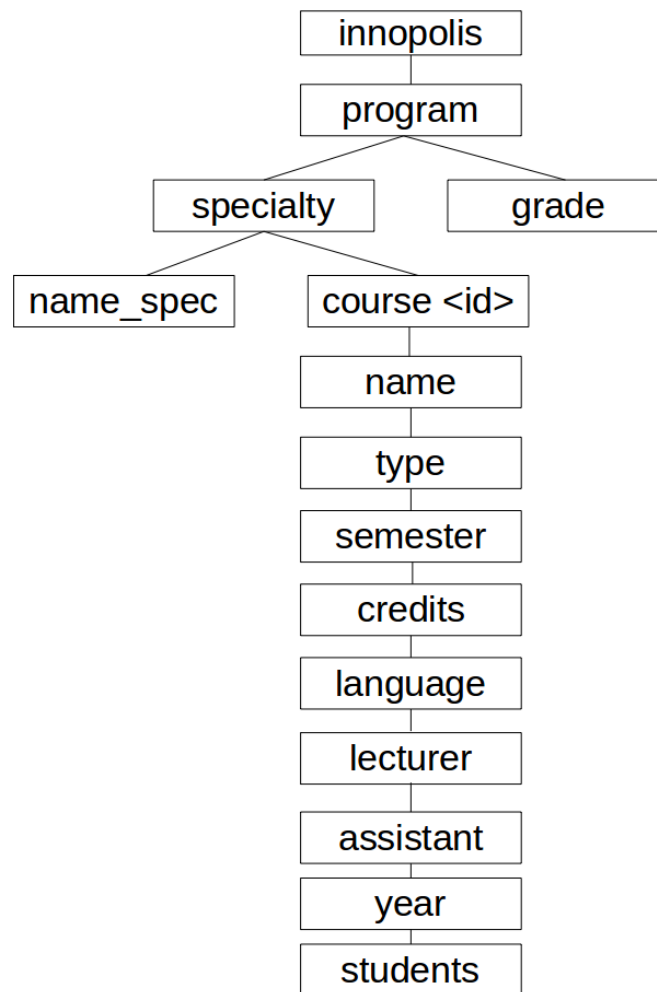
Figure 3: The Structure of the XML document

```
1   <!ELEMENT innopolis (program*)>
2   <!ELEMENT program (grade+, speciality*)>
3   <!ELEMENT grade (#PCDATA)>
4   <!ELEMENT speciality (name_spec+, course*)>
5   <!ELEMENT name_spec (#PCDATA)>
6   <!ELEMENT course (name, type, semester, credits, language, lecturer+,
7                     assistant*, year, students)>
8   <!ELEMENT name (#PCDATA)>
9   <!ELEMENT type (#PCDATA)>
10  <!ELEMENT semester (#PCDATA)>
11  <!ELEMENT credits (#PCDATA)>
12  <!ELEMENT language (#PCDATA)>
13  <!ELEMENT lecturer (#PCDATA)>
14  <!ELEMENT assistant (#PCDATA)>
15  <!ELEMENT year (#PCDATA)>
16  <!ELEMENT students (#PCDATA)>
17
18  <!ATTLIST course id CDATA #REQUIRED>
```

Figure 4: The Document Type Definition

2. Write a CSS stylesheet (Figure 12) for the XHTML (Figure 13) output that at least defines colors for each characteristic in data

```
<!--definition of simple elements-->
    <xs:element name="name" type="xs:string"/>
    <xs:element name="type" type="xs:string"/>
    <xs:element name="semester" type="xs:string"/>
    <xs:element name="credits" type="xs:integer"/>
    <xs:element name="language" type="xs:string"/>
    <xs:element name="lecturer" type="xs:string"/>
    <xs:element name="assistant" type="xs:string"/>
    <xs:element name="students" type="xs:string"/>
```

Figure 5: Description of simple elements

```
<!--definition of complex elements-->
    <xs:element name="innopolis">
        <xs:complexType>
            <xs:sequence>
            <xs:element name="program" maxOccurs="unbounded">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element ref="grade"/>
                        <xs:element name="speciality" minOccurs="0" maxOccurs="unbounded">
                        <xs:complexType>
                            <xs:sequence>
                                <xs:element ref="name_spec"/>
                                <xs:element name="course" minOccurs="0" maxOccurs="unbounded">
                                    <xs:complexType>
                                        <xs:sequence>
                                            <xs:element ref="name"/>
                                            <xs:element ref="type"/>
                                            <xs:element ref="semester"/>
                                            <xs:element ref="credits"/>
                                            <xs:element ref="language"/>
                                            <xs:element ref="lecturer"/>
                                            <xs:element ref="assistant" minOccurs="0"/>
                                            <xs:element ref="year"/>
                                            <xs:element ref="students"/>
                                        </xs:sequence>
                                        <xs:attribute ref="id"/>
                                    </xs:complexType>
                                </xs:element>
                            </xs:sequence>
                        </xs:complexType>
                    </xs:element>
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
            </xs:sequence>
        </xs:complexType>
    </xs:element>
```

Figure 6: Description of complex elements

```
<!--defifnition of attributes-->
    <xs:attribute name="id" type="xs:integer"/>
```

Figure 7: Description of attributes

6

```
<!-- RESTRICTIONs -->
    <xs:element name="grade">
        <xs:simpleType>
            <xs:restriction base="xs:string">
                <xs:pattern value="Master|Bachelour"/>
            </xs:restriction>
        </xs:simpleType>
    </xs:element>

    <xs:element name="name_spec">
        <xs:simpleType>
            <xs:restriction base="xs:string">
                <xs:pattern value="([a-zA-z]|[ ])+"/>
            </xs:restriction>
        </xs:simpleType>
    </xs:element>

    <xs:element name="year">
        <xs:simpleType>
            <xs:restriction base="xs:integer">
                <xs:pattern value="[2][0][1-9][0-9]"/>
            </xs:restriction>
        </xs:simpleType>
    </xs:element>
```

Figure 8: Description of restrictions

Validate an XML file

Read here how to validate your XML files (including referenced DTDs) online with just a few mouse clicks.

No errors were found

The following files have been uploaded so far:

XML document:

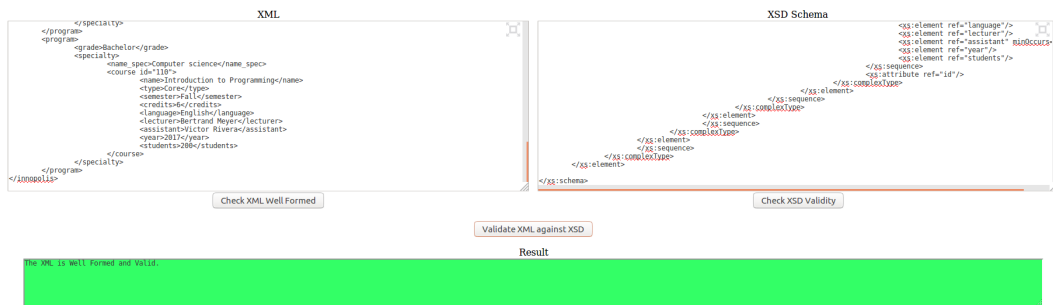Figure 9: Validation of the XML with the DTD

Figure 10: Validation of the XML with the XSD

Figure 11: XSLT

```css
 1 ▾ body {
 2       background-image: url("img/background.png");
 3       margin: 30px;
 4       color: #2F4F4F;
 5       font-family:Verdana;
 6   }
 7
 8 ▾ img {
 9       float:right;
10       width:15%;
11   }
12
13 ▾ h1 {
14       text-align: center;
15       border: 6px groove #228B22;
16       padding: 10px;
17
18   }
19
20 ▾ h2 {
21       letter-spacing: 3px;
22       font-size:27px;
23       margin-top:65px;
24   }
25
26 ▾ h3 {
27       letter-spacing: 2px;
28       font-size:24px;
29       margin:40px 0px 40px;
30   }
31
32 ▾ h4 {
33       letter-spacing: 1px;
34       font-size:20px;
35       margin:30px 0px 30px;
36   }
```

```css
38
39 ▾ h5 {
40       letter-spacing: 3px;
41       font-size:17px;
42       text-align:center;
43       margin:20px 0px 20px;
44   }
45
46 ▾ h6 {
47       letter-spacing: 1px;
48       font-size:16px;
49       text-align:center;
50       background-color: #4CAF50;
51       color:white;
52       padding: 10px;
53       margin: 0px;
54   }
55
56 ▾ table {
57       border-collapse: collapse;
58       width: 100%;
59       margin-bottom: 40px;
60       border:1px solid black;
61   }
62
63 ▾ th, td {
64       text-align: center;
65       padding: 15px;
66       border:1px solid black;
67   }
68
69 ▾ tr:hover {
70       background-color:#f5f5f5;
71   }
```

CSS   Ln 71, col 2   Sel 0 (1)   92

Figure 12:   CSS

Educational Program

Program

Master

Specialty

S N E

Course

id	Name	Type	Semester	Credits	Language	Lecturer	Assistant	Year	Students
845	Essential Skills	Core	Fall	6	English	Stanislav Litvinov	Anatoly	2017	30

Course

id	Name	Type	Semester	Credits	Language	Lecturer	Assistant	Year	Students
846	Common Internet Application	Core	Fall	6	English	Prof. Rasheed Hussain	Anatoly	2017	30

Figure 13:   XHTML

9

3 Conclusion

After completing the assignments, I understood some of the technologies that I always wanted to learn.

For example, **Wiki** allows you to organize collaborative work on a project and share knowledge with others. The **XML**, unlike **HTML**, was designed to store and transport data. I also learned that **XML** is a hierarchical database. In addition, I understood what the schemas (**DTD** and **XSD**) are for. It was great to realize that well-formed is not the same as well-valid.

I did not know what the **XHTML** format meant before, but now I know that this is a strict **HTML** format that combines the strength of **HTML** and the power of **XML**. It was also useful to learn how the **XML** document is converted to **HTML** via the **XSLT** stylesheet.

But I did not learn anything new in **CSS**, because I used to work with it earlier, but still it was useful for me.

Finally this was my first report on the LaTeX.

4 References

[1] Dokuwiki https://www.dokuwiki.org/dokuwiki.

[2] W3schools https://www.w3schools.com/.

[3] Online-validator http://www.utilities-online.info/xsdvalidation

5 Appendices

5.1 XML with DTD

5.1.1 File innopolis.xml

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE innopolis SYSTEM "innopolis.dtd">
<innopolis>
        <program>
                <grade>Master</grade>
                <specialty>
                        <name_spec>SNE</name_spec>
                        <course id="845">
                                <name>Essential Skills</name>
                                <type>Core</type>
                                <semester>Fall</semester>
                                <credits>6</credits>
                                <language>English</language>
                                <lecturer>Stanislav Litvinov</lecturer>
                                <assistant>Anatoly</assistant>
                                <year>2017</year>
                                <students>30</students>
                        </course>
                        <course id="846">
                                <name>Common Internet Application</name>
                                <type>Core</type>
                                <semester>Fall</semester>
                                <credits>6</credits>
                                <language>English</language>
                                <lecturer>Prof. Rasheed Hussain</lecturer>
                                <assistant>Anatoly</assistant>
                                <year>2017</year>
                                <students>30</students>
                        </course>
                        <course id="035">
                                <name>Introduction to IT Entrepreneurship</name>
                                <type>Elective</type>
                                <semester>Fall</semester>
                                <credits>3</credits>
                                <language>Russian</language>
                                <lecturer>Alexander Semenov</lecturer>
                                <year>2017</year>
                                <students>30</students>
                        </course>
                </specialty>
                <specialty>
                        <name_spec>MSIT</name_spec>
                        <course id="841">
                                <name>Introduction to Personal Software Process</name>
                                <type>Core</type>
                                <semester>Fall</semester>
                                <credits>6</credits>
                                <language>English</language>
                                <lecturer>Larisa Safina</lecturer>
                                <year>2017</year>
                                <students>30</students>
                        </course>
                </specialty>
        </program>
        <program>
                <grade>Bachelor</grade>
                <specialty>
                        <name_spec>Computer science</name_spec>
                        <course id="110">
                                <name>Introduction to Programming</name>
                                <type>Core</type>
                                <semester>Fall</semester>
                                <credits>6</credits>
                                <language>English</language>
                                <lecturer>Bertrand Meyer</lecturer>
                                <assistant>Victor Rivera</assistant>
                                <year>2017</year>
                                <students>200</students>
```

```
            </course>
        </specialty>
    </program>
</innopolis>
```

5.1.2 File innopolis.dtd

```
<!ELEMENT innopolis (program*)>
<!ELEMENT program (grade+, specialty*)>
<!ELEMENT grade (#PCDATA)>
<!ELEMENT specialty (name_spec+, course*)>
<!ELEMENT name_spec (#PCDATA)>
<!ELEMENT course (name, type, semester, credits, language, lecturer+,
                                    assistant*, year, students)>
<!ELEMENT name (#PCDATA)>
<!ELEMENT type (#PCDATA)>
<!ELEMENT semester (#PCDATA)>
<!ELEMENT credits (#PCDATA)>
<!ELEMENT language (#PCDATA)>
<!ELEMENT lecturer (#PCDATA)>
<!ELEMENT assistant (#PCDATA)>
<!ELEMENT year (#PCDATA)>
<!ELEMENT students (#PCDATA)>

<!ATTLIST course id CDATA #REQUIRED>
```

5.2 XML with XSD

5.2.1 File innopolis.xml

```
<?xml version="1.0" encoding="UTF-8"?>

<innopolis xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
                    xsi:schemaLocation="innopolis.xsd">
    <program>
        <grade>Master</grade>
        <specialty>
            <name_spec>SNE</name_spec>
            <course id="845">
                <name>Essential Skills</name>
                <type>Core</type>
                <semester>Fall</semester>
                <credits>6</credits>
                <language>English</language>
                <lecturer>Stanislav Litvinov</lecturer>
                <assistant>Anatoly</assistant>
                <year>2017</year>
                <students>30</students>
            </course>
            <course id="846">
                <name>Common Internet Application</name>
                <type>Core</type>
                <semester>Fall</semester>
                <credits>6</credits>
                <language>English</language>
                <lecturer>Prof. Rasheed Hussain</lecturer>
                <assistant>Anatoly</assistant>
                <year>2017</year>
                <students>30</students>
            </course>
            <course id="035">
                <name>Introduction to IT Entrepreneurship</name>
                <type>Elective</type>
                <semester>Fall</semester>
                <credits>3</credits>
                <language>Russian</language>
                <lecturer>Alexander Semenov</lecturer>
                <year>2017</year>
                <students>30</students>
            </course>
        </specialty>
        <specialty>
            <name_spec>MSIT</name_spec>
            <course id="841">
                <name>Introduction to Personal Software Process</name>
```

```xml
                                <type>Core</type>
                                <semester>Fall</semester>
                                <credits>6</credits>
                                <language>English</language>
                                <lecturer>Larisa Safina</lecturer>
                                <year>2017</year>
                                <students>30</students>
                        </course>
                </specialty>
        </program>
        <program>
                <grade>Bachelor</grade>
                <specialty>
                        <name_spec>Computer science</name_spec>
                        <course id="110">
                                <name>Introduction to Programming</name>
                                <type>Core</type>
                                <semester>Fall</semester>
                                <credits>6</credits>
                                <language>English</language>
                                <lecturer>Bertrand Meyer</lecturer>
                                <assistant>Victor Rivera</assistant>
                                <year>2017</year>
                                <students>200</students>
                        </course>
                </specialty>
        </program>
</innopolis>
```

5.2.2 File innopolis.xsd

```xml
<?xml version="1.0" encoding="ISO-8859-1"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">

<!--definition of simple elements-->
        <xs:element name="name" type="xs:string"/>
        <xs:element name="type" type="xs:string"/>
        <xs:element name="semester" type="xs:string"/>
        <xs:element name="credits" type="xs:integer"/>
        <xs:element name="language" type="xs:string"/>
        <xs:element name="lecturer" type="xs:string"/>
        <xs:element name="assistant" type="xs:string"/>
        <xs:element name="students" type="xs:string"/>

<!-- RESTRICTIONs -->
        <xs:element name="grade">
                <xs:simpleType>
                        <xs:restriction base="xs:string">
                                <xs:pattern value="Master|Bachelor"/>
                        </xs:restriction>
                </xs:simpleType>
        </xs:element>

        <xs:element name="name_spec">
                <xs:simpleType>
                        <xs:restriction base="xs:string">
                                <xs:pattern value="([a-zA-z]|[ ])+"/>
                        </xs:restriction>
                </xs:simpleType>
        </xs:element>

        <xs:element name="year">
                <xs:simpleType>
                        <xs:restriction base="xs:integer">
                                <xs:pattern value="[2][0][1-9][0-9]"/>
                        </xs:restriction>
                </xs:simpleType>
        </xs:element>

<!--defifnition of attributes-->
        <xs:attribute name="id" type="xs:integer"/>

<!--definition of complex elements-->
<xs:element name="innopolis">
<xs:complexType>
 <xs:sequence>
```

```xml
  <xs:element name="program" maxOccurs="unbounded">
   <xs:complexType>
          <xs:sequence>
           <xs:element ref="grade"/>
                  <xs:element name="specialty" minOccurs="0" maxOccurs="unbounded">
                    <xs:complexType>
                          <xs:sequence>
                            <xs:element ref="name_spec"/>
                                  <xs:element name="course" minOccurs="0" maxOccurs="unbounded">
                                    <xs:complexType>
                                          <xs:sequence>
                                                <xs:element ref="name"/>
                                                <xs:element ref="type"/>
                                                    <xs:element ref="semester"/>
                                                    <xs:element ref="credits"/>
                                                    <xs:element ref="language"/>
                                                    <xs:element ref="lecturer"/>
                                                    <xs:element ref="assistant" minOccurs="0"/>
                                                    <xs:element ref="year"/>
                                                    <xs:element ref="students"/>
                                          </xs:sequence>
                                        <xs:attribute ref="id"/>
                                     </xs:complexType>
                                  </xs:element>
                          </xs:sequence>
                        </xs:complexType>
                  </xs:element>
           </xs:sequence>
          </xs:complexType>
  </xs:element>
</xs:schema>
```

5.3 XML with XSLT and CSS

5.3.1 File innopolis.xml

```xml
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="innopolis.xsl"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict

<innopolis>
        <program>
                <grade>Master</grade>
                <specialty>
                        <name_spec>SNE</name_spec>
                        <course id="845">
                                <name>Essential Skills</name>
                                <type>Core</type>
                                <semester>Fall</semester>
                                <credits>6</credits>
                                <language>English</language>
                                <lecturer>Stanislav Litvinov</lecturer>
                                <assistant>Anatoly</assistant>
                                <year>2017</year>
                                <students>30</students>
                        </course>
                        <course id="846">
                                <name>Common Internet Application</name>
                                <type>Core</type>
                                <semester>Fall</semester>
                                <credits>6</credits>
                                <language>English</language>
                                <lecturer>Prof. Rasheed Hussain</lecturer>
                                <assistant>Anatoly</assistant>
                                <year>2017</year>
                                <students>30</students>
                        </course>
                        <course id="035">
                                <name>Introduction to IT Entrepreneurship</name>
                                <type>Elective</type>
                                <semester>Fall</semester>
                                <credits>3</credits>
```

```
                                                <language>Russian</language>
                                                <lecturer>Alexander Semenov</lecturer>
                                                <year>2017</year>
                                                <students>30</students>
                                </course>
                        </specialty>
                        <specialty>
                                <name_spec>MSIT</name_spec>
                                <course id="841">
                                        <name>Introduction to Personal Software Process</name>
                                        <type>Core</type>
                                        <semester>Fall</semester>
                                        <credits>6</credits>
                                        <language>English</language>
                                        <lecturer>Larisa Safina</lecturer>
                                        <year>2017</year>
                                        <students>30</students>
                                </course>
                        </specialty>
                </program>
                <program>
                        <grade>Bachelor</grade>
                        <specialty>
                                <name_spec>Computer science</name_spec>
                                <course id="110">
                                        <name>Introduction to Programming</name>
                                        <type>Core</type>
                                        <semester>Fall</semester>
                                        <credits>6</credits>
                                        <language>English</language>
                                        <lecturer>Bertrand Meyer</lecturer>
                                        <assistant>Victor Rivera</assistant>
                                        <year>2017</year>
                                        <students>200</students>
                                </course>
                        </specialty>
                </program>
</innopolis>
```

5.3.2   File innopolis.xsl

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
<xsl:template match="/">
<html>
        <head>
                <link rel="stylesheet" type="text/css" href="innopolis.css"/>
                <title>Innopolis University</title>
        </head>
        <body>
          <h1>Educational Program</h1>
                <img src="img/Innopolis.png" alt="Innopolis"></img>
          <xsl:for-each select="innopolis/program">
                <h2>Program</h2>
                <h3><xsl:value-of select="grade"/></h3>
                <p></p>
                <xsl:for-each select="specialty">
                  <h4>Specialty</h4>
                  <h5><xsl:value-of select="name_spec"/></h5>
                        <p></p>
                        <xsl:for-each select="course">
                        <h6>Course</h6>
                          <table>
                            <tr>
                                <th>id</th>
                                <th>Name</th>
                                <th>Type</th>
                                <th>Semester</th>
                                <th>Credits</th>
                                <th>Language</th>
                                <th>Lecturer</th>
                                <th>Assistant</th>
                                <th>Year</th>
                                <th>Students</th>
                            </tr>
                            <tr>
```

```
                                <td><xsl:value-of select="@id"/></td>
                                <td><xsl:value-of select="name"/></td>
                                <td><xsl:value-of select="type"/></td>
                                <td><xsl:value-of select="semester"/></td>
                                <td><xsl:value-of select="credits"/></td>
                                <td><xsl:value-of select="language"/></td>
                                <td><xsl:value-of select="lecturer"/></td>
                                <td><xsl:value-of select="assistant"/></td>
                                <td><xsl:value-of select="year"/></td>
                                <td><xsl:value-of select="students"/></td>
                            </tr>
                        </table>
                    </xsl:for-each>
                </xsl:for-each>
            </xsl:for-each>
        </body>
</html>
</xsl:template>
</xsl:stylesheet>
```

5.3.3   File innopolis.css

```
body {
    background-image: url("img/background.png");
        margin: 30px;
        color: #2F4F4F;
        font-family:Verdana;
}


img {
        float:right;
        width:15%;
}


h1 {
        text-align: center;
        border: 6px groove #228B22;
        padding: 10px;

}


h2 {
        letter-spacing: 3px;
        font-size:27px;
    margin-top:65px;
}


h3 {
        letter-spacing: 2px;
        font-size:24px;
    margin:40px 0px 40px;
}


h4 {
        letter-spacing: 1px;
        font-size:20px;
    margin:30px 0px 30px;
}



h5 {
        letter-spacing: 3px;
        font-size:17px;
        text-align:center;
    margin:20px 0px 20px;
}


h6 {
        letter-spacing: 1px;
        font-size:16px;
        text-align:center;
    background-color: #4CAF50;
    color:white;
    padding: 10px;
    margin: 0px;
}
```

```css
table {
    border-collapse: collapse;
    width: 100%;
    margin-bottom: 40px;
    border:1px solid black;
}

th, td {
    text-align: center;
    padding: 15px;
    border:1px solid black;
}

tr:hover {
    background-color:#f5f5f5;
}
```