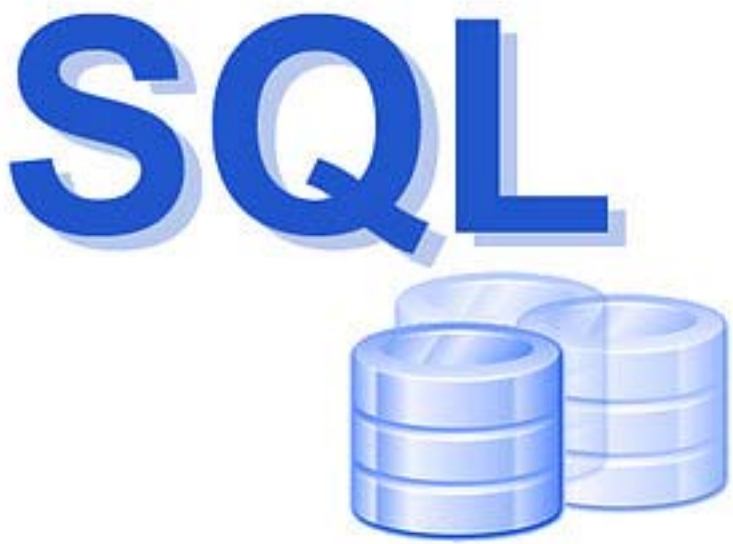
CEWP 459

PHP Programming with MySQL – Level I

Regular Expressions

SQL Review



Tutorial on basic SQL commands

MySQL Workbench

DEMO CONNECTION and Setup

Sakila database

1. Install structure.
2. load data.
3. Complete tutorial

Option 2 (Just SQL, no PHP)

- http://sqlfiddle.com

SQL Fiddle

sqlfiddle.com/#!2/de0b9/1

Apps | Business, Finance an... | Education | LAN | Other | RSS | Search & Reference | SNC Lavalin | Technology | Grooveshark | Other bookmarks

SQL Fiddle | MySQL 5.5.32 | View Sample Fiddle | Clear | Login | Text to DDL | Donate | Flattr this! | About

```
CREATE TABLE tutorials_tbl(
   tutorial_id INT NOT NULL AUTO_INCREMENT,
   tutorial_title VARCHAR(100) NOT NULL,
   tutorial_author VARCHAR(40) NOT NULL,
   submission_date DATE,
   PRIMARY KEY ( tutorial_id )
   );

insert into tutorials_tbl values (null, 'x' , 'y', '2013-02-(
```

Build Schema | Edit Fullscreen | Browser | [;]

```
select * from tutorials_tbl;
```

Run SQL | Edit Fullscreen | Format Code | [;]

TUTORIAL_ID	TUTORIAL_TITLE	TUTORIAL_AUTHOR	SUBMISSION_DATE
1	x	y	February, 02 2013 00:00:00+0000

Record Count: 1; Execution Time: 2ms | View Execution Plan | link

SQL Fiddle Setup

- Create a table with the following attributes

Student

ID:	integer, auto-increment, not null
FirstName:	varchar(45) not null
LastName:	varchar(45) not null
Age:	integer not null

Data

John Doe, 45

Mary Smith, 44

Glen Quagmire, 49

Roger Waters, 33

David Gilmore, 41

Query revisit

Retrieve:

1. The youngest student.
2. The average student age.
3. Names ending with “re”.
4. The number of records.

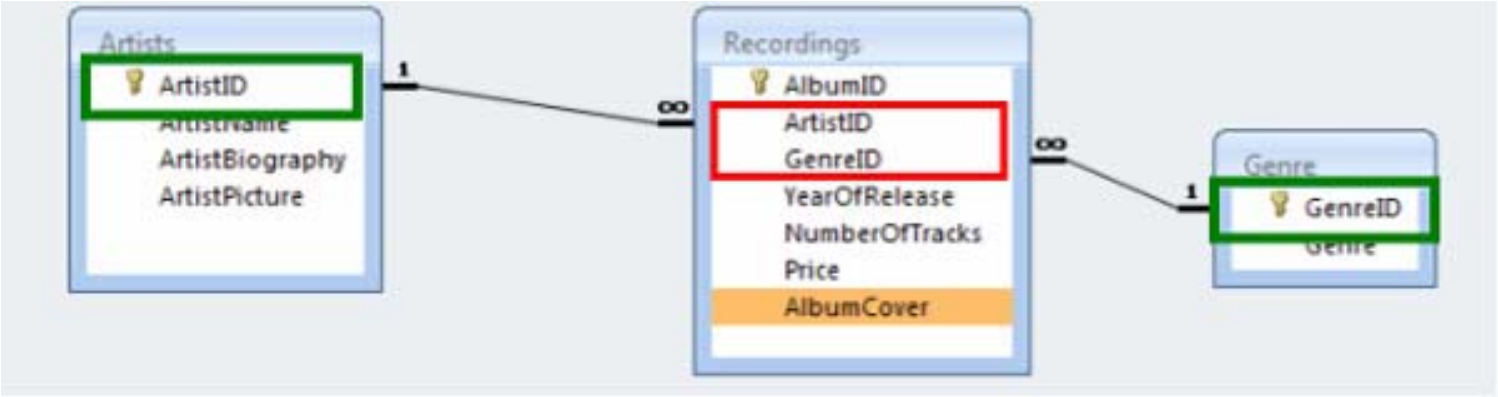
Primary Key

- Always unique
- In every table you always will have a key
- Singular or Compound*
- Naming: Generic key – ID, or use the proper name.
  Eg: Social Insurance Number = SIN
- Compound – Made up of 2 columns to make the value unique

Foreign Key

- When a PRIMARY key is placed in another table, it is called a “Foreign Key”.
- Eg:
- **STUDENT_TYPE (ID, Type).**
- **STUDENT (ID, Name, Student_Type_ID).**
  - Student Type (F, ‘Full Time’)
  - Student Type (P, ‘Part Time’)
  - Student (1, Brendan, ‘P’)
  - Student (2, Mary, ‘F’)

Example of a Junction Table (Many to many)



= primary key

= foreign key

Setup Tables (Database = CorpDB)

- Table: Department
  - DepartmentID
  - DepartmentName

- Table: Employee
  - EmployeeID
  - LastName
  - DepartmentID

Employee

LastName	DepartmentID
Rafferty	31
Jones	33
Steinberg	33
Robinson	34
Smith	34
John	NULL

Department

DepartmentID	DepartmentName
31	Sales
33	Engineering
34	Clerical
35	Marketing

Inner Join Notation 1

```
SELECT *
FROM employee INNER JOIN department
  ON employee.DepartmentID =
department.DepartmentID;
```

Inner Join Notation 2

```
SELECT *
FROM employee, department
WHERE employee.DepartmentID =
department.DepartmentID;
```

Natural Join

- This is a type of join that joins tables based on column names, automatically.
- In the case of employee and department, both have DepartmentID fields, so this will be the join field.

LEFT outer join

```
SELECT *
FROM employee LEFT OUTER JOIN department
  ON employee.DepartmentID =
department.DepartmentID;
```

Right Outer Join

```
SELECT *
FROM employee RIGHT OUTER JOIN department
  ON employee.DepartmentID =
department.DepartmentID;
```

MySQLi

Connect

- mysqli_connect command is used to connect to the DB.
- Format:
  mysqli_connect(*host,username,password,dbname*);

Parameter	Description
host	Either a host name or an IP address -> localhost:port
username	The MySQL user name -> root
password	The password to log in with -> mysql
dbname	The default database to be used when performing queries -> Database name you created for this assignment. (or your course DB).

Connect Example

```
<?php
// Create connection
$con=mysqli_connect("localhost",
"cewp459s00","abc123","cewp559s00");

// Check connection
if (mysqli_connect_errno())
  {
  echo "Failed to connect to MySQL: " .
mysqli_connect_error();
  }
?>
```

Error reporting

- Usually it's a good idea to enable PHP for detecting ALL SQL errors. By default it doesn't.
- mysqli_report(MYSQLI_REPORT_ERROR | MYSQLI_REPORT_STRICT);
- This throws a mysqli exception when an error is detected.

Close Connection

- Please note, connection is automatically closed at the end of your script. This is to close a connection EARLY.

```
<?php
$con=mysqli_connect("example.com","peter","a
bc123","my_db");

// Check connection
if (mysqli_connect_errno())
  {
  echo "Failed to connect to MySQL: " .
mysqli_connect_error();
  }

mysqli_close($con);
?>
```

Query + Error Checking

```
// Perform a query, check for error
if (!mysqli_query($con,"INSERT INTO
Persons (FirstName) VALUES ('Glenn')"))
  {
  echo("Error description: " .
mysqli_error($con));
  }
```

MySQL Base commands

Function	Description
mysqli_query()	Performs a query against the database
mysqli_affected_rows()	Returns the number of affected rows in the previous MySQL operation
mysqli_connect_errno()	Returns the error code from the last connection error
mysqli_connect_error()	Returns the error description from the last connection error
mysqli_fetch_array()	Fetches a result row as an associative, a numeric array, or both
mysqli_fetch_all()	Fetches all result rows as an associative array, a numeric array, or both

MySQL Base commands

Function	Description
mysqli_info()	Returns information about the most recently executed query
mysqli_more_results()	Checks if there are more results from a multi query
mysqli_multi_query()	Performs one or more queries on the database
mysqli_sqlstate()	Returns the SQLSTATE error code for the last MySQL operation
mysqli_commit()	Commits the current transaction
mysqli_rollback()	Rolls back the current transaction for the database

Connection Steps

- Define connection
- Connect
- Check the connection
- Build query
- Execute query
- Check if successful, unsuccessful
- Report result

General SQL Statements (no result)

- mysqli_query(connection, sql)

Create Table
Don’t forget error checking level.

```
$con=mysqli_connect(“xxx",“xxx",“xxx",“xxx");
mysqli_report(MYSQLI_REPORT_ERROR | MYSQLI_REPORT_STRICT);

// Check connection
if (mysqli_connect_errno())
  {
  echo "Failed to connect to MySQL: " . mysqli_connect_error();
  }

// Create table
$sql="CREATE TABLE Persons(FirstName CHAR(30),LastName CHAR(30),Age INT)";

// Execute query
if (mysqli_query($con,$sql))
           echo "Table persons created successfully"
else
           echo "Error creating table: " . mysqli_error($con);
```

INSERT INTO

```
$con=mysqli_connect("example.com","peter","abc123","my_db");
// Check connection
if (mysqli_connect_errno())
  {
  echo "Failed to connect to MySQL: " . mysqli_connect_error();
  }

mysqli_query($con,"INSERT INTO Persons (SIN, FirstName, LastName, Age)
VALUES (12345, 'Peter', 'Griffin',35)");

mysqli_query($con,"INSERT INTO Persons (SIN, FirstName, LastName, Age)
VALUES (23456, 'Glenn', 'Quagmire',33)");

mysqli_close($con);
```

Exercise – Insert (15 mins)

- Insert 3 rows into your student table using PHP.
- Specify column names and leave out the key column (since it's auto-filled … auto-increment).
- `INSERT INTO Persons (FirstName, LastName, Age)`
  `VALUES ('Peter', 'Griffin',35)");`

```
PID INT NOT NULL AUTO_INCREMENT,
PRIMARY KEY(PID),
FirstName CHAR(15),
LastName CHAR(15),
Age INT
```

Mysqli SELECT row by row

- Define the query with **mysqli_query** and place the result into a pointer variable.
- Use **mysqli_fetch_array(pointer)**, until there are no more rows and place the result into a variable.
- How to test if more rows? The result of **mysqli_fetch_array(pointer)** will be positive.

SELECT

1. Open your DB, connect, evaluate, etc…
2. Perform command (Select)
3. Step through results
4. Close db.

- ```
  $result = mysqli_query($con,"SELECT * FROM Persons");

  while($row = mysqli_fetch_array($result))
  {
    echo $row['FirstName'] . " " . $row['LastName'];
    echo "<br>";
  }
  ```
  ```

Select – Notes

- We can use WHERE in the select, and even JOIN's. The format is up to you. Also ORDER BY counts.
- You can also build your SELECT dynamically .. Example, sometimes we want ORDER BY DESCENDING, sometimes ORDER BY ASCENDING.
- If the SELECT is COMPLEX, test your select statement in HeidiSQL or in TOAD before putting it into your PHP

- **Important**: In the real world, best practice we would put our SELECT statements in "include" files.
- **Also Important**: Another good practice is to read you entries from the db into OBJECTS from a class.

Exercise – SELECT (10 mins)

- Select all rows from the table you have created.
- Use the mysqli_fetch_array statement inside a WHILE loop.

Ex – Display results in HTML table (15 mins)

- Use the same logic as EX3.
- But factor in the HTML aspect.

```
echo "<table border='1'>
<tr>
<th>Firstname</th>
<th>Lastname</th>
</tr>";
while($row = mysqli_fetch_array($result))
  {
  echo "<tr>";
  echo "<td>" . $row['FirstName'] . "</td>";
  echo "<td>" . $row['LastName'] . "</td>";
  echo "</tr>";
  }
echo "</table>";
```

Ex – Select statement built dynamically.

Perform 2 selects

#1, ORDER BY LastName Ascending

#2, ORDER BY LastName Descending

Make sure your select statement is common for both.

Order by is CONCATINATED

Eg:

```
$a="Select * from TABLE{space}";
$b="order by X descending;";
$result = mysqli_query($con, $a . $b);
```

MySQLi fetch all

```
$con=mysqli_connect("localhost","my_user","my_password","my_db");
// Check connection
if (mysqli_connect_errno())
  {
  echo "Failed to connect to MySQL: " . mysqli_connect_error();
  }

$sql="SELECT Lastname,Age FROM Persons ORDER BY Lastname";
$result=mysqli_query($con,$sql);

// Fetch all
mysqli_fetch_all($result,MYSQLI_ASSOC);

// Free result set
mysqli_free_result($result);

mysqli_close($con);
```

- MYSQLI_ASSOC
- MYSQLI_NUM
- MYSQLI_BOTH

Update

```
$newage = 41;

mysqli_query($con,"UPDATE Persons
SET Age=" . $newage . " WHERE
FirstName='Peter' AND LastName='Griffin'");
```

DELETE

- `mysqli_query($con,"DELETE FROM Persons WHERE LastName='Griffin'");`

Exercise – Update + Delete

- Update and Delete a row you have created in your table.
- What you update and what you delete are up to you.

ODBC

- ODBC allows you to connect to a data source (e.g. an MSSQL database).
- Use odbc_connect() to connect to the DB.
- Use odbc_exec() to run an SQL statement.
- Use odbc_fetch_row() to fetch a record from the DB.
- Use odbc_result() to use a field from the record.
- odbc_close() will close the connection.

ODBC Example

```
$conn=odbc_connect('northwind','','');
if (!$conn)
  {exit("Connection Failed: " . $conn);}
$sql="SELECT * FROM customers";
$rs=odbc_exec($conn,$sql);
if (!$rs)
  {exit("Error in SQL");}
echo "<table><tr>";
echo "<th>Companyname</th>";
echo "<th>Contactname</th></tr>";
while (odbc_fetch_row($rs))
  {
  $compname=odbc_result($rs,"CompanyName");
  $conname=odbc_result($rs,"ContactName");
  echo "<tr><td>$compname</td>";
  echo "<td>$conname</td></tr>";
  }
odbc_close($conn);
echo "</table>";
```

PDO

Intro to PDO

```
$db = new
PDO('mysql:host=localhost;dbname=testdb;c
harset=utf8', 'username', 'password');
```

- Error handling; different from standard Mysqli format.

```
try
{
     $db->query('hi'); //invalid query!
}
catch(PDOException $ex)
{
     echo "An Error occured!”;
     echo $ex->getMessage());
}
```

Exercise Setup

- Create a table or two for testing.
- Suggestions
- Employee Table (ID, Name, Role)
- SKU Table (SKU, Name, Price)

- Add about 3 rows of data for each

Fetching rows from a table

- To fetch rows using basic PDO, we can do this.

```
foreach($db->query('SELECT * FROM table')
as $row) {
    echo $row['field1'].'
'.$row['field2']; //etc...
}
```

Rewrite previous slide's code

- Separate the query and the for-each, to see more accurately how each component works.

Fetching rows from a table.

- This is more object oriented.

```
$stmt = $db->query('SELECT * FROM table');

while($row = $stmt->fetch(PDO::FETCH_ASSOC))
{
        echo $row['field1'].' '.$row['field2'];
}
```

- **PDO::FETCH_ASSOC:** returns an array indexed by column name
- **PDO::FETCH_BOTH** (default): returns an array indexed by both column name and number
- **PDO::FETCH_BOUND**: Assigns the values of your columns to the variables set with the ->bindColumn() method
- **PDO::FETCH_CLASS**: Assigns the values of your columns to properties of the named class. It will create the properties if matching properties do not exist
- **PDO::FETCH_INTO**: Updates an existing instance of the named class
- **PDO::FETCH_LAZY**: Combines PDO::FETCH_BOTH/PDO::FETCH_OBJ, creating the object variable names as they are used
- **PDO::FETCH_NUM**: returns an array indexed by column number
- **PDO::FETCH_OBJ**: returns an anonymous object with property names that correspond to the column names

FetchAll

- Fetch-all into a $results array.

```
$db = new
PDO('mysql:host=localhost;dbname=cewp559g01;c
harset=utf8', 'root', ’xxxxxx');
$stmt = $db->prepare('SELECT * FROM test1');
$stmt->execute();
$results = $stmt->fetchAll(PDO::FETCH_ASSOC);
print_r($results);
```

Row count for fetched rows

- This will put the value of the count of rows into $row_count.

```
$stmt = $db->query('SELECT * FROM
table');
$row_count = $stmt->rowCount();
echo $row_count.' rows selected';
```

Last record ID

- To get the ID of the last record inserted (very useful).

```
$result = $db->exec("INSERT INTO
table(firstname, lastname) VALUES('John',
'Doe')");
$insertId = $db->lastInsertId();
```

Updates / Inserts

- Updates and inserts are done as follows:

```
$affected_rows = $db->exec("UPDATE table
SET field='value'");
echo $affected_rows.' were affected'
```

Parameters

- We can pass variable values to the statements;

```
$stmt = $db->prepare("SELECT * FROM table
WHERE id=? AND name=?");
$stmt->execute(array($id, $name));
$rows = $stmt-
>fetchAll(PDO::FETCH_ASSOC);
```

Named Placeholders

```
$stmt = $db->prepare("SELECT * FROM table
WHERE id=:id AND name=:name");
$stmt->bindValue(':id',     ,
PDO::PARAM_INT);
$stmt->bindValue(':name', $name,
PDO::PARAM_STR);
$stmt->execute();
$rows = $stmt-
>fetchAll(PDO::FETCH_ASSOC);
```

Named Placeholders 2

```
$stmt = $db->prepare("SELECT * FROM table
WHERE id=:id AND name=:name");
$stmt->execute(array(':name' => $name,
':id' => $id));
$rows = $stmt-
>fetchAll(PDO::FETCH_ASSOC);
```

Insert Statement (Prepared)

```
$stmt = $db->prepare("INSERT INTO
table(field1,field2,field3,field4,field5)
VALUES(:field1,:field2,:field3,:field4,:f
ield5)");
$stmt->execute(array(':field1' =>
$field1, ':field2' => $field2, ':field3'
=> $field3, ':field4' => $field4,
':field5' => $field5));
$affected_rows = $stmt->rowCount();
```

Delete from Table

```
$stmt = $db->prepare("DELETE FROM table WHERE
id=:id");
$stmt->bindValue(':id', $id, PDO::PARAM_STR);
$stmt->execute();
$affected_rows = $stmt->rowCount();
```

Update

```
$stmt = $db->prepare("UPDATE table SET
name=? WHERE id=?");
$stmt->execute(array($name, $id));
$affected_rows = $stmt->rowCount();
```

Multiple Execution Example

```
# Prepare the query ONCE
$stmt = $conn->prepare('INSERT INTO tablename
VALUES(:name)');
$stmt->bindParam(':name', $name);

# First insert
$name = 'Joe';
$stmt->execute();

# Second insert
$name = 'Larry';
$stmt->execute();
```

PDO Exercise 1
15 minutes.

- Use an existing table in your db, or create a new one.
- Insert more than one row using the technique above into the table.

PDO with objects (Intro)

- Step 1: Define a class matching a database table.
- Step 2: Set fetch mode to FETCH_CLASS.
- Step 3: Use the result object the same way as a class object.

Review Fetch Modes

- **PDO::FETCH_ASSOC**: Returns an array.
- **PDO::FETCH_BOTH**: Returns an array, indexed by both column-name, and 0-indexed.
- **PDO::FETCH_BOUND**: Returns TRUE and assigns the values of the columns in your result set to the PHP variables to which they were bound.
- **PDO::FETCH_CLASS**: Returns a new instance of the specified class.
- **PDO::FETCH_OBJ**: Returns an anonymous object, with property names that correspond to the columns.

Class Example

```
class User {
  public $first_name;
  public $last_name;

  public function full_name()
  {
      return $this->first_name . ' ' .
            $this->last_name;
  }
}
```

Fetch Example

```
try {
  $pdo = new PDO('mysql:host=localhost;dbname=x', $uname, $passwd);
  $pdo->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);

  $result = $pdo->query('SELECT * FROM someTable');

  # Map results to object
  $result->setFetchMode(PDO::FETCH_CLASS, 'User');

  while($user = $result->fetch()) {
    # Call our custom full_name method
    echo $user->full_name();
  }
} catch(PDOException $e) {
  echo 'Error: ' . $e->getMessage();
}
```

PDO Class Ex. 1
30 Minutes

- Using the table you created in the multiple-insert example:
- Write a class-based fetch to read the data into objects.
- Display the object contents to the screen.

SQL Injection

SQL Injection

- SQL injection is the most common software exploit
- It affects not just PHP but other languages also.
- Affects dynamically constructed queries.

Example

- txtUserId = getRequestString("UserId");
- txtSQL = "SELECT * FROM Users WHERE UserId = " + txtUserId;

- Most common example:
  - Add 1=1 to the end of the statement.

  Eg:

  txtUserId = “ 5 or 1=1”;

Exercise 1a

- Create a database table in your MySQL account
- Name: Users
- Attributes: UserId (integer), Name, Password
- Fill in a few rows of test data. For the password you can use a plain password for this example, or you can make a program to encrypt the values if you have more time.

Exercise 1b

- Create a form that accepts an ID, and then displays the record(s) on the next form in a table.
- It should build the query like the previous example.

- Step 1 : on the resulting page, JUST display the query and observe it.
- Step 2 : Make the real form that displays the data, and try to put the SQL injection hack into it.

More advanced: You can create a web service environment (refer to the BASIC web service I showed in previous classes).

SQL Injection Example 2

- By inserting : " or ""="
- We do almost the same thing as previously.

```
uName = getRequestString("UserName");
uPass = getRequestString("UserPass");

sql = "SELECT * FROM Users WHERE Name ='" +
uName + "' AND Pass ='" + uPass + "'"
```

Exercise 2

- Create a form that accepts a username and password just like the previous example, and then displays the record(s) on the next form in a table.

- Step 1 : on the resulting page, JUST display the query and observe it.
- Step 2 : Make the real form that displays the data, and try to put the SQL injection hack into it.

Batched SQL Injection

SIMILAR TO ORIGINAL EXAMPLE

- txtUserId = getRequestString("UserId");
- txtSQL = "SELECT * FROM Users WHERE UserId = " + txtUserId;

- Example:
  - Add an extra statement to the end of the line.

  Eg:

  txtUserId = “ 5; delete from tablename;”;

How to solve:

- Very easy: Use parameters like we learned in the PDO class:

:parameter1 :parameter2

This way the parameters are parsed independently and you cannot "construct" an SQL command.

Remember to set your DB connection to a "Real" parameterized mode:

```
$dbConnection->setAttribute(PDO::ATTR_EMULATE_PREPARES, false);
$dbConnection->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
```

Example of a basic DB class

- DB.class
  - Methods
    - InsertBook(array)
    - UpdateBook(array)
    - DeleteBook(array)
    - InsertAuthor(array)
    - UpdateAuthor(array)
    - DeleteAuthor(array)

DB Class More in depth

- Global Values
  - DB connection
- Private Methods
  - Connect
  - Disconnect

Create Structure for an application for testing your db.

1. Main Menu
   - Manage books

Authors

1. Authors
   - List authors
   - For each book, include a delete link and an update link
   - Include an “Add” link at the bottom with appropriate fields to add a record.

Books

1. Books
   - List books
   - For each book, include details, a delete link and an update link
   - Include an “Add” link at the bottom
   - For the Add link, create appropriate fields to add a record.

UNIVERSITÉ Concordia UNIVERSITY

CONCORDIA.CA