New Course Request

Indiana University
Indianapolis Campus

Check Appropriate Boxes:  Undergraduate credit  Graduate credit  Professional credit

1. School/Division: Science/Mathematical Sciences  Academic Subject Code: STAT

3. Course Number: 52100  (must be cleared with University Enrollment Services)

4. Instructor: S. Ghosh

5. Course Title: Introduction to Statistical Computing

6. First time this course is to be offered (Semester/Year): Fall 2009

7. Credit Hours: Fixed at 3.0 or Variable from _______ to _______

8. Is this course to be graded S-F (only)? Yes ___ No ___ X

9. Is variable title approval being requested? Yes ___ No ___ X

10. Course description (not to exceed 50 words) for Bulletin publication:
P: STAT 51200 or MATH 35100 or MATH 51100. The course demonstrates how computing can be used to understand the performance of core statistical methods and introduces modern statistical methods that require computing in their application. Covers relevant programming fundamentals in at least two programming environments (e.g., SAS and R/Splus).

11. Lecture Contact Hours: Fixed at 3 or Variable from _______ to _______

12. Non-Lecture Contact Hours: Fixed at N/A or Variable from N/A to _______

13. Estimated enrollment: 20 of which 100% percent are expected to be graduate students.

14. Frequency of scheduling: Fall  Will this course be required for majors? No

15. Justification for new course: Needed to enhance the training of students in the Applied Statistics Program.

16. Are the necessary reading materials currently available in the appropriate library? Yes

17. Please append a complete outline of the proposed course, and indicate instructor (if known), textbooks, and other materials.

18. If this course overlaps with existing courses, please explain with which courses it overlaps and whether this overlap is necessary, desirable, or unimportant.

19. A copy of every new course proposal must be submitted to departments, schools, or divisions in which there may be overlap of the new course with existing courses or areas of strong concern, with instructions that they send comments directly to the originating Curriculum Committee. Please append a list of departments, schools, or divisions thus consulted.

Submitted by: Baki Bako  Date 4/11/09

Department Chairman/Division Director

Approved by: James Murray  Date 4/17/2009

Dean

Chancellor/Vice-President

University Enrollment Services

After School/Division approval, forward the last copy (without attachments) to University Enrollment Services for initial processing, and the remaining four copies and attachments to the Campus Chancellor or Vice-President.
# Purdue University

## Request for Addition, Expiration, or Revision of a Graduate Course

### (60000-60000 Level)

**Department:** Science/Mathematical Sciences  
**Effective Session:** Fall 2009

**INSTRUCTIONS:** Please check the items below which describe the purpose of this request.

- [x] 1. New course with supporting documents (complete proposal form)
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit type
- [ ] 7. Change in course attributes
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered
- [ ] 12. Transfer from one department to another

### PROPOSED:

**Subject Abbreviation:** STAT  
**Course Number:** 52100

**Long Title:** Introduction to Statistical Computing  
**Short Title:** Intro to Statistical Computing

**Abbreviated title will be entered by the Office of the Registrar if omitted. (80 Characters Only)**

### EXISTING:

**Subject Abbreviation**

**Course Number**

### TERMS OFFERED:

- [x] Summer  
- [x] Fall  
- [ ] Spring

**CAMPUS(ES) INVOLVED:**

- [X] Calumet  
- [ ] N. Central  
- [ ] Cont Ed  
- [ ] Tech Statewide  
- [ ] Ft. Wayne  
- [X] W. Lafayette

### CREDIT TYPE:

<table>
<thead>
<tr>
<th>1. Fixed Credit: Cr. Hrs.</th>
<th>3.0</th>
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</thead>
<tbody>
<tr>
<td>2. Variable Credit Range: Minimum Cr. Hrs. (Check One) To</td>
<td>Or</td>
</tr>
<tr>
<td>Maximum Cr. Hrs.</td>
<td>Yes</td>
</tr>
<tr>
<td>3. Equivalent Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>4. Thesis Credit: Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

### COURSE ATTRIBUTES:

- [ ] 1. Pass/Not Pass Only
- [ ] 2. Satisfactory/Unsatisfactory Only
- [ ] 3. Repeatable
- [ ] 4. Credit by Examination
- [ ] 5. Special Fees
- [ ] 6. Registration Approval Type
- [ ] Department
- [ ] Instructor
- [ ] 7. Variable Title
- [ ] 8. Honors
- [ ] 9. Full Time Privilege
- [ ] 10. Off Campus Experience

### COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

P: STAT 51200 or MATH 35100 or MATH 51100. The course demonstrates how computing can be used to understand the performance of core statistical methods and introduces modern statistical methods that require computing in their application. Covers relevant programming fundamentals in at least two programming environments (e.g. SAS and R/plus).

### Signature Information:

- Calumet Department Head: Date:  
- Calumet School Dean: Date:  
- Calumet Undergrad Curriculum Committee: Date:  
- Fort Wayne Department Head: Date:  
- Fort Wayne School Dean: Date:  
- Fort Wayne Chancellor: Date:  
- Undergrad Curriculum Committee: Date:  
- Indianapolis Department Head: Date:  
- Indianapolis School Dean: Date:  
- Data Approved by Graduate Council: Date:  
- North Central Department Head: Date:  
- North Central Chancellor: Date:  
- Graduate Council Secretary: Date:  
- West Lafayette Department Head: Date:  
- West Lafayette College/School Dean: Date:  
- West Lafayette Registrar: Date:  

**Office of the Registrar**
Supporting Document for a New Graduate Course

To: Purdue University Graduate Council

From: Faculty Member: Samiran Ghosh
Department: Math
Campus: IUPUI

Date: 04/06/2009

Subject: Proposal for New Graduate Course-Documentation Required by the Graduate Council to Accompany Registrar’s Form 40G

Contact for information if questions arise:

Name: Andrea Brian
Phone Number: 317-278-4127
E-mail: abrian@math.iupui.edu
Campus Address: LD 270

Course Subject Abbreviation and Number: STAT 52100
Course Title: Introduction to Statistical Computing

A. Justification for the Course:

- Provide a complete and detailed explanation of the need for the course (e.g., in the preparation of students, in providing new knowledge/training in one or more topics, in meeting degree requirements, etc.), how the course contributes to existing fields of study and/or areas of specialization, and how the course relates to other graduate courses offered by the department, other departments, or interdisciplinary programs.

- Justify the level of the proposed graduate course (50000- or 60000-level) including statements on, but not limited to: (1) the target audience, including the anticipated number of undergraduate and graduate students who will enroll in the course; and (2) the rigor of the course.

B. Learning Outcomes and Method of Evaluation or Assessment:

- Describe the course objectives and student learning outcomes that address the objectives (i.e., knowledge, communication, critical thinking, ethical research, etc.).

- Describe the methods of evaluation or assessment of student learning outcomes. (Include evidence for both direct and indirect methods.)

- Grading criteria (select from dropdown box); include a statement describing the criteria that will be used to assess students and how the final grade will be determined.

Criteria: Papers and Projects
• Identify the method(s) of instruction (select from dropdown box) and describe how the methods promote the likely success of the desired student learning outcomes.

Method of Instruction  Lecture

C. Prerequisite(s):

• List prerequisite courses by subject abbreviation, number, and title.

• List other prerequisites and/or experiences/background required. If no prerequisites are indicated, provide an explanation for their absence.

D. Course Instructor(s):

• Provide the name, rank, and department/program affiliation of the instructor(s).

• Is the instructor currently a member of the Graduate Faculty?  ____ Yes  ____ No (If the answer is no, indicate when it is expected that a request will be submitted.)

E. Course Outline:

• Provide an outline of topics to be covered and indicate the relative amount of time or emphasis devoted to each topic. If laboratory or field experiences are used to supplement a lecture course, explain the value of the experience(s) to enhance the quality of the course and student learning. For special topics courses, include a sample outline of a course that would be offered under the proposed course.

F. Reading List (including course text):

• A primary reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material.

• A secondary reading list or bibliography should include material students may use as background information.

G. Library Resources

• Describe the library resources that are currently available or the resources needed to support this proposed course.

H. Example of a Course Syllabus  (While not a necessary component of this supporting document, an example of a course syllabus is available, for information, by clicking on the link below, which goes to the Graduate School's Policies and Procedures Manual for Administering Graduate Student Programs. See Appendix K.)


(Revised and Approved by the Graduate Council 2/08)
Supporting Document for a New Graduate Course
STAT 52100 Introduction to Statistical Computing

A. Justification for the Course

This is an introductory course to learn computing as required by other statistics course in and outside IUPUI. The main goals of this course are to demonstrate how computing can be used to understand the performance of core statistical methods, and to introduce modern statistical methods that require computing for their application. Relevant programming fundamentals are also covered. Students will learn computing in two entirely different programming environments, namely SAS and R/Splus. The semester will be roughly divided into two half's. In the first half students will learn SAS and the second half will be dedicated mostly to R/Splus. LaTex will be covered in at least one or two lectures (probably at the very end of the semester). Note that LaTex is not a computing environment; rather it is used to write mathematical reports/papers, and therefore is a useful tool for future. No prior programming experience is required; however knowledge about the core statistical methodology (probability/regression/ANOVA) is necessary.

This course is designed for both M.S. students in the Applied Statistics program (as an elective course) and for first-year Ph.D. students in the Biostatistics Ph.D. program. Although it is also an elective for the Ph.D. students, it is a required prerequisite for the course BIOS S621 (Advanced Statistical Computing). BIOS S621 can be chosen by Ph.D. students to serve as an advanced elective in their program.

B. Learning Outcomes and Method of Evaluation or Assessment

Learning Outcomes
As described in Part A, the focus of the course is on learning computing in two entirely different programming environments, namely SAS and R/Splus.

Method of Evaluation/Assessment
• There will be project assignments due either every week or every other week.
• There will be no exam in this course; however, there will be a final term project.
• The class grades will be determined based on your performance in all course requirements. (100%-80% A, 80%-70% B, 70%-60% C, 60%-50% D)
  ☐ 80% on class projects
  ☐ 20% on final term project. The final term project will be significantly more involved than a regular class project and you will have to make a presentation of your findings.
    • 10% for oral presentation
    • 10% for quality of the project

C. Prerequisites

Knowledge of knowledge the core statistical methodology (probability/regression/ANOVA) is necessary, so completion of a course like STAT 51200 (Applied Regression Analysis)
would be helpful. An undergraduate level course in linear algebra (such as MATH 35100 or MATH 51100), or the consent of the instructor, may also serve as the prerequisite.

D. Course Instructor

Samiran Ghosh  
Email: samiran@math.iupui.edu  
Phone: 317-278-0473  
Office: LD 224U

E. Course Outline

<table>
<thead>
<tr>
<th>Tentative Course Schedule</th>
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<tbody>
<tr>
<td>DATE</td>
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<td>Jan 7th</td>
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<td>April 21st</td>
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<td>April 23rd</td>
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F. Reading List

Textbooks:

Programs:
- SAS (available in LD 225 or other campus computer labs)
- R (available in LD 225 or at www.R-project.org (free to download))

Additional resources (available from course website):
1. Monte Carlo Statistical Methods (2nd edition) by Christian P. Robert, George Casella
2. A whole book R for the beginners
3. Data Mining with R
4. Writing R package
5. Brief History of Monte Carlo

G. Library Resources

N/A

H. Example of a Course Syllabus

STAT 52100 (3 cr.)
Introduction to Statistical Computing

Syllabus

A. Instructor:
Dr. Samiran Ghosh
Email: samiran@math.iupui.edu
Office Hours: 4:30-5:30PM on Monday and Wednesday, or by appointment (LD 224U)

B. Brief Course Description and Educational Objectives:
This is an introductory course to learn computing as required by other statistics course in and outside IUPUI. The main goals of this course are to demonstrate how computing can be used to understand the performance of core statistical methods, and to introduce modern statistical
methods that require computing for their application. Relevant programming fundamentals are also covered. We will learn computing in two entirely different programming environments, namely SAS and R/Splus. The semester will be roughly divided into two half's. In the first half we will learn SAS and the second half we will dedicate mostly to R/Splus. I also intend to cover LaTex in at least one or two lectures (probably at the very end of the semester). Note that LaTex is not a computing environment; rather it is used to write mathematical reports/papers. Nevertheless, this is a useful tool for future. No prior programming experience is required; however knowledge about the core statistical methodology (probability/regression/ANOVA) is necessary.

This course is designed for both M.S. students in the Applied Statistics program and for first-year PhD students in the Biostatistics Ph.D. program. It is a required prerequisite for the course BIOS S621 (Advanced Statistical Computing).

C. Prerequisites:
Knowledge of the core statistical methodology (probability/regression/ANOVA) is necessary, so completion of a course like STAT 51200 (Applied Regression Analysis) would be helpful. An undergraduate level course in linear algebra (such as MATH 35100 or MATH 51100), or the consent of the instructor, may also serve as the prerequisite.

D. Course Activities & Evaluation:
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  - 20% on final term project. The final term project will be significantly more involved than a regular class project and you will have to make a presentation of your findings.
    - 10% for oral presentation
    - 10% for quality of the project

F. Tentative Course Schedule

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPICS</th>
<th>LINKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 7th</td>
<td>An Introduction to SAS System (Version 9.xx)</td>
<td>Handout1</td>
</tr>
<tr>
<td>Jan 9th</td>
<td>Manipulating data in SAS</td>
<td>Handout2</td>
</tr>
<tr>
<td>Jan 14th</td>
<td>Proc Format</td>
<td>Handout3 , SAS3</td>
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<tr>
<td>Jan 16th</td>
<td></td>
<td>Handout4</td>
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<tr>
<td>Jan 23th</td>
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<tr>
<td>Jan 28th</td>
<td></td>
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</tbody>
</table>
| Jan 30th   | Introduction to SAS Graphics               | Handout5    
<p>|            |                                             | white paper |
| Feb 4th    | Introduction to PROC IML                   | Handout6    |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Notes</th>
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<tr>
<td>Feb 6th</td>
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<td>Feb 11th</td>
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<td>Handout7</td>
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<td>Handout8</td>
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<tr>
<td>Feb 18th</td>
<td>Introduction to SAS Macro</td>
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<td>Feb 20th</td>
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<td>Feb 27th</td>
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<td>March 3rd</td>
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<tr>
<td>March 5th</td>
<td>Some R Facts</td>
<td>RHandout3</td>
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<tr>
<td>Week of March 10th</td>
<td>Spring Break</td>
<td>Project Description</td>
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<tr>
<td>March 17th</td>
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<td>March 19th</td>
<td>Import export in R</td>
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<td>March 24th</td>
<td>A short notes on LaTeX</td>
<td>latex1 latex2</td>
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<tr>
<td>March 26th</td>
<td></td>
<td></td>
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<tr>
<td>March 31th</td>
<td>Functions and Loops in R</td>
<td>RHandout5</td>
</tr>
<tr>
<td>April 2th</td>
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<tr>
<td>April 7th</td>
<td>R Graphics</td>
<td>RHandout6 some codes</td>
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<td>April 9th</td>
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<tr>
<td>April 14th</td>
<td>Grid Based Graphics</td>
<td>RHandout7</td>
</tr>
<tr>
<td>April 16th</td>
<td>Random no generation</td>
<td>Random (Thanks to Christian Robert)</td>
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<tr>
<td>April 21th</td>
<td>Monte Carlo methods</td>
<td>Monte Carlo (Thanks to Michael Mascagni)</td>
</tr>
<tr>
<td>April 23rd</td>
<td>Essence of EM algorithm</td>
<td>EM Algo (I will cover first 50 pages only)</td>
</tr>
<tr>
<td>April 28th</td>
<td>Project Presentation</td>
<td></td>
</tr>
</tbody>
</table>

G. Required and Recommended Texts:

Textbooks:

Programs:
- **SAS** (available in LD 225 or other campus computer labs)
- **R** (available in LD 225 or at [www.R-project.org](http://www.R-project.org) (free to download))

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2. A whole book _R for the beginners_
3. _Data Mining with R_
4. _Writing R package_
5. _Brief History of Monte Carlo_
I. Cheating and Plagiarism:
Academic misconduct will not be tolerated and all cases will be reported. Examine the IU Code of Student Rights, Responsibilities, and Conduct at http://www.iupui.edu/code and in particular examine the rules regarding academic misconduct at http://www.iupui.edu/code/#P2_G. Violations of these rules will result in a grade of "F" (or 0%) for the assignment in question, and may result in an "F" for the course or even expulsion from the university (see http://life.iupui.edu/rights/undergrad/sanctions.html).

J. Americans with Disabilities Act
If you need any special accommodations due to a disability, please contact Adaptive Educational Services at (317)-274-3241. Joseph T. Taylor Hall (UC), Room 137.
STAT 52100 (3 cr.)
Introduction to Statistical Computing

Syllabus

A. Instructor:
   Dr. Samiran Ghosh
   Email: samiran@math.iupui.edu
   Office Hours: 4:30-5:30PM on Monday and Wednesday, or by appointment (LD 224U)

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This course is designed for both M.S. students in the Applied Statistics program and for first-year PhD students in the Biostatistics Ph.D. program. It is a required prerequisite for the course BIOS S621 (Advanced Statistical Computing).

C. Prerequisites:
   STAT 51200 (Applied Regression Analysis) or an undergraduate level course in linear algebra (such as MATH 35100 or MATH 51100)

D. Course Description for Bulletin:
   P: STAT 51200 or MATH 35100 or MATH 51100. The course demonstrates how computing can be used to understand the performance of core statistical methods and introduces modern statistical methods that require computing in their application. Covers relevant programming fundamentals in at least two programming environments (e.g. SAS and R/Plus).

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<tbody>
<tr>
<td>Jan 7th</td>
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<td>Handout1</td>
</tr>
<tr>
<td></td>
<td>(Version 9.xx)</td>
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<tr>
<td>Jan 9th</td>
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<td>Handout3, SAS3</td>
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<tr>
<td>Jan 16th</td>
<td>Proc Format</td>
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<tr>
<td>Jan 30th</td>
<td>Introduction to SAS Graphics</td>
<td>Handout5, white paper</td>
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<tr>
<td>Feb 4th</td>
<td>Introduction to PROC IML</td>
<td>Handout6</td>
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<td>Feb 6th</td>
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<td>Feb 11th</td>
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<tr>
<td>April 7th</td>
<td>R Graphics</td>
<td>RHandout6, some codes</td>
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<td>April 9th</td>
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<td>April 14th</td>
<td>Grid Based Graphics</td>
<td>RHandout7</td>
</tr>
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<td>April 16th</td>
<td>Random no generation</td>
<td>Random (Thanks to Christian Robert)</td>
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<tr>
<td>April 21th</td>
<td>Monte Carlo methods</td>
<td>Monte Carlo (Thanks to Michael Mascagni)</td>
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<tr>
<td>April 23rd</td>
<td>Essence of EM algorithm</td>
<td>EM Algo (I will cover first 50 pages only)</td>
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<tr>
<td>April 28th</td>
<td>Project Presentation</td>
<td></td>
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</table>
G. Required and Recommended Texts:
   Textbooks:

   Programs:
   - SAS (available in LD 225 or other campus computer labs)
   - R (available in LD 225 or at www.R-project.org (free to download))

H. Other Helpful References:
2. A whole book R for the beginners
3. Data Mining with R
4. Writing R package
5. Brief History of Monte Carlo

I. Bibliography:
N/A

J. Cheating and Plagiarism:
   Academic misconduct will *not* be tolerated and all cases will be reported. Examine the IU Code of Student Rights, Responsibilities, and Conduct at http://www.iupui.edu/code and in particular examine the rules regarding academic misconduct at http://www.iupui.edu/code/#P2_G. Violations of these rules will result in a grade of "F" (or 0%) for the assignment in question, and may result in an "F" for the course or even expulsion from the university (see http://life.iupui.edu/rights/undergrad/sanctions.html).

K. Americans with Disabilities Act
   If you need any special accommodations due to a disability, please contact Adaptive Educational Services at (317)-274-3241. Joseph T. Taylor Hall (UC), Room 137.