COURSE OUTLINE
ELEC639B Selected Topics in Image Processing:
Variational PDE Models and Applications in Image Processing
Spring 2008

Instructor: Dr. W.-S. Lu
Phone: 8692
E-mail: wslu@ece.uvic.ca

Office Hours: Days: Wednesdays
Time: 15:00 – 17:00
Location: EOW 427

Lectures:
Section(s): S01
Days: Tuesdays, Wednesdays, and Fridays
Time: 1:30 – 2:30
Location: ECS 128

Required Text:
Title: Lecture Notes
Author: W.-S. Lu
Publisher:
Year: 2007

Assessment:
Assignments: Problems: 35%  MATLAB Programs: 15 %
Project I: 20%, Project II: 30 %
Mid-term
Final

Due dates for assignments:
Assignment 1: Jan. 16
Assignment 2: Jan. 23
Assignment 3: Jan. 30
Assignment 4: Feb. 6
Assignment 5: Feb. 13
Assignment 6: Feb. 22
Assignment 7: Mar. 7
Assignment 8: Mar. 18
The final grade obtained from the above marking scheme will be based on the following percentage-to-grade point conversion:

\[
\begin{align*}
90 \leq & \quad A+ \leq 100 \\
85 \leq & \quad A \ < \ 90 \\
80 \leq & \quad A- \ < \ 85 \\
75 \leq & \quad B+ \ < \ 80 \\
70 \leq & \quad B \ < \ 75 \\
65 \leq & \quad B- \ < \ 70 \\
60 \leq & \quad C+ \ < \ 65 \\
55 \leq & \quad C \ < \ 60 \\
50 \leq & \quad D \ < \ 55 \\
35 \leq & \quad E \ < \ 50 \quad \text{Fail, conditional supplemental exam* - for undergraduate courses only.} \\
F \ < & \quad 35 \quad \text{Fail, no supplemental exam.} \\
N \ < & \quad 35 \quad \text{Fail, did not write examination or otherwise complete course requirements by the end of the term or session; no supplemental exam.}
\end{align*}
\]

* The rules for supplemental examinations are found on page 79 of the current 2007/08 Undergraduate Calendar.

<table>
<thead>
<tr>
<th>Term in which E Grade was obtained:</th>
<th>Application Deadline for Supplemental Exam</th>
<th>Supplemental Exam Date</th>
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</thead>
<tbody>
<tr>
<td>First term of Winter Session (Sept – Dec)</td>
<td>Following February 28</td>
<td>First week of following May</td>
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<tr>
<td>Second term of Winter Session (Jan – Apr)</td>
<td>Following June 30</td>
<td>First week of following September</td>
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<tr>
<td>Summer Session (May – Aug)</td>
<td>Following October 31</td>
<td>First week of following January</td>
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</tbody>
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Deferred exams will normally be written at the start of the student's next academic term; i.e., approximately 4 months following the deferral of the exam.

**Syllabus**

**Introduction** 3
Digital images, Image models, Variational PDE methods.

**Background Mathematics** 9
Functionals and Euler-Lagrange equations, Function spaces Lp and W1,p, Functions of bounded variation, Banach space and topology, Elements of differential geometry, Finite difference methods for PDEs.

**Image Restoration** 13

**Image Segmentation** 13
Mumford-Shah functional, Regularity of edge set, Approximation of the M-S functional, Geometric active contours and the level-set method, Kass-Witkin-Terzopoulos model, Geodesic active contours model, the level-set method, the Chan-Vese model.