Geophys 6211
Advanced Seismic Interpretation

Syllabus – Fall Semester
Instructor: Dr. Kelly Liu
Professor of Geophysics

Office: McNutt hall B-43; Phone: 341-6724; email: liukh@mst.edu
URL: http://www.mst.edu/~liukh
Lectures and Labs
Office hours: by appointment

Catalog Description
The integration of geologic information, well log data and seismic information for interpreting the earth’s subsurface using advanced 3-D seismic interpretation software packages. Reservoir identification and evaluation as well as horizon and formation attributes are included. Prerequisite: Geophys 3210 or Geophys 5202.

Course Objectives
GEOPHYS 6211: Advanced Seismic Interpretation is a course designed for graduate students:

- To acquire skills in interpretation of 3-D seismic data
- To enhance theoretical knowledge of seismic structural interpretation, stratigraphic interpretation, reservoir identification and evaluation, and horizon and formation attributes
- To master SMT-KINGDOM Suite seismic interpretation software

Course Grading
Course grade will be based on the homework and labs on interpretation of seismic data on the geoworkstations and data processing (30%); a midterm exam (20%); a course project with presentation (20%); and a final exam (30%).
A: ≥90%; B: 80%-89%; C: 70-79%; 60-69%; F: <60.

Required Text Book:
- Interpretation of Three-Dimensional Seismic Data, Brown

Reference Books:
- Basic exploration geophysics, Robinson and Coruh
- Seismic stratigraphy, basin analysis and reservoir characterisation, Veeken
## Tentative Course Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Content</th>
<th>Refs</th>
</tr>
</thead>
</table>
| W1   | Introduction  
Review basic concepts: Waves; Wavelet; Seismic sections  
2D vs. 3D: Seismic display | Ch1 |
| W2   | Volume concept; Slicing the data volume  
Dynamic range and data loading; Polarity and color  
Character and zero-phaseness | Ch1 |
| W3   | Labor Day Holiday – no class Sept. 7  
Color principles; Interpretative value of color  
SMT Kingdom | Ch2 |
| W4   | Structural interpretation  
Direct contouring and the importance of the strike perspective  
Fault recognition and mapping  
Interpretation in the vicinity of salt; Composite displays  
Interpretation procedure  
Advantage and disadvantages of different displays;  
Subtle structural features; Visualization and autotracking | Ch3 |
| W5   | Stratigraphic interpretation  
Seismic facies; Internal reflection configuration  
External geometry of seismic facies units | Veeken Ch3 |
| W6   | Recognition of characteristic shape  
Methods of making horizon slices  
Unconformity horizon slices; Windowed amplitude | Ch4 |
| W7   | Seismic Facies | |
| W8   | Reservoir identification  
Bright spot; Dim spot; Polarity Reversal | Ch5 |
| W9   | **Midterm Exam**  
Examples of bright spots, flat spots, dim spots, phase changes; Polarity and phase problems | Ch5 |
| W10  | Direct hydrocarbon indicators  
AVO; Shear wave exploration | Ch5 |
| W11  | Hilbert transform; Instantaneous amplitude, phase, frequency resolution; Vertical and horizontal resolutions | Ch5 |
| W12  | Tuning phenomena in reservoirs  
Horizon and formation attributes  
Classification of attributes  
Time-derived horizon attributes Coherence  
Post-stack amplitude attributes | Ch6 |
| W13  | Reservoir evaluation  
Reservoir properties from seismic; Horizon slices over reservoir interfaces; Composite amplitude; Net pay thickness  
Horizon and formation attributes  
Hybrid attributes; Frequency-derived attributes;  
Volumetric attributes and curvature;  
Horizon and formation attributes  
Spectral decomposition | Ch8 |
GEOPHYS 6211

<table>
<thead>
<tr>
<th>Semester</th>
<th>Topic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>W14</td>
<td>4D seismic exploration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final exam - Comprehensive</td>
<td>Ch13</td>
</tr>
<tr>
<td>W15</td>
<td>Project Presentations</td>
<td></td>
</tr>
</tbody>
</table>

**Class Policies**
- Class attendance and participation is required. Please be on time. You need to get my pre-approval to receive credit for any absence.
- Late works will not be accepted, unless you get the approval from the instructor before the deadline.

**How to get a good grade**
- Come to lectures; Memorizing through understanding
- Do homework/labs individually; Questions? Ask

**Academic Dishonesty:** [http://registrar.mst.edu/academicregs/index.html](http://registrar.mst.edu/academicregs/index.html) Page 30 of the Student Academic Regulations handbook describes the student standard of conduct relative to the System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism or sabotage.