CREDIT HOURS: 3
3 EXAMS: EACH 20% OF COURSE GRADE
HOMEWORK: 20% OF COURSE GRADE
ATTENDANCE/PARTICIPATION: 10% OF COURSE GRADE
FIELD TRIPS (UP TO 3): 5% OF COURSE GRADE
PRESENTATION: 5% OF COURSE GRADE

COURSE DESCRIPTION: THEORY AND PRACTICE OF GEOPHYSICS AS APPLIED TO EXPLORATION AND DEVELOPMENT OF NATURAL RESOURCES INCLUDING OIL, COAL, MINERALS AND GROUNDWATER. OTHER APPLICATIONS OF GEOPHYSICS INCLUDE STUDY OF ARCHAEOLOGICAL AND ENVIRONMENTAL SITES, AS WELL AS CRUSTAL STUDIES OF EARTHQUAKE ZONES AND METEORITE IMPACT AREAS. APPLIED GEOPHYSICAL METHODS STUDIED INCLUDE SEISMIC REFRACTION, REFLECTION, AND SURFACE WAVES, AND GRAVITY AND MAGNETIC SURVEYING. ADDITIONAL TOPICS MAY BE SELECTED FROM ELECTRICAL RESISTIVITY, ELECTROMAGNETIC AND GEORADAR SURVEYING AND GEOPHYSICAL WELL LOGGING. MATHEMATICS, PHYSICS, AND GEOLOGY ARE REVIEWED AND DEVELOPED AS NEEDED. UP TO THREE ONE DAY FIELD TRIPS MAY BE CONDUCTED ON SELECTED WEEKENDS. FIELD TRIPS MAY INVOLVE USE OF GEOPHYSICAL INSTRUMENTS FOR DATA COLLECTION. COMPUTER AIDED INTERPRETATION OF DATA IS REQUIRED. ALSO DEPENDING ON AVAILABILITY, FIELD TRIPS MAY BE MADE TO PROFESSIONAL GEOPHYSICAL SERVICE COMPANIES CONDUCTING DATA ACQUISITION IN THE AREA.

TEXT: AN INTRODUCTION TO GEOPHYSICAL EXPLORATION by PHILIP KEARY, MICHAEL BROOKS, AND IAN HILL 3rd EDITION 2002 BLACKWELL PUBLISHING

CLASS MEETINGS

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<th>MATHEMATICAL PRELIMINARIES</th>
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<td>M W F</td>
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<td>A. A REVIEW OF BASIC MATHEMATICS REQUIRED</td>
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<td>C. EXAMPLES OF EQUATIONS APPLIED IN GEOPHYSICS</td>
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<td>D. PHYSICAL PRINCIPLES IN GEOPHYSICS</td>
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<td>E. ROCK PROPERTIES AND GEOPHYSICAL MEASUREMENTS</td>
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<th>WEEKS: 4, 5, 6</th>
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<td>A. CONTINUOUS AND DIGITAL GEOPHYSICAL SIGNALS</td>
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<td>B. LINEAR SYSTEMS AND THE SUPERPOSITION PRINCIPLE</td>
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<td>C. TWO SIMPLE MODELS: SPRINGS AND STRINGS</td>
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<td>D. IMPULSE AND IMPULSE RESPONSE</td>
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<td>E. CONVOLUTION AND CORRELATION</td>
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<td>F. FOURIER TRANSFORMS AND SPECTRUM ANALYSIS</td>
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<td>G. GAUSSIAN FUNCTIONS</td>
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<td>H. DIGITAL FILTERING OF GEOPHYSICAL DATA</td>
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<td>I. ADVANCED PROCESSING METHODS</td>
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EXAM #1: TAKE HOME EXAM COVERING ALL THE ABOVE MATERIAL (OCTOBER 2, FRIDAY)
APPLIED GEOPHYSICS  
GEOLOGY 436

WEEKS: 7, 8, 9, 10  III.  SEISMOLOGY  
No classes: SAT OCT 10 at noon, + 11th, 12th, 13th,  
FALL BREAK: classes resume on WED OCT 14th  
A. SEISMIC WAVE PROPAGATION PRINCIPLES  
B. SEISMIC SURFACE WAVES  
C. SEISMIC REFRACTION SURVEYING  
D. SEISMIC REFLECTION SURVEYING  
E. PROCESSING OF SEISMIC DATA  
F. SEISMIC RESPONSE OF GEOLOGICAL STRUCTURES  
G. MODELING AND INTERPRETATION SEISMIC DATA

EXAM #2: EXAM COVERING ALL OF SEISMOLOGY FROM SECTION III ABOVE  
(October 30th)

WEEKS: 11, 12  IV.  GRAVITY  
A. GRAVITATION  
B. GRAVITY FIELD OF THE EARTH  
C. MEASUREMENT OF GRAVITY  
D. GRAVITY SURVEYING  
E. PROCESSING OF GRAVITY DATA  
F. GRAVITY ANOMALIES  
G. GRAVITY FIELD OF GEOLOGICAL STRUCTURES  
H. MODELING AND INTERPRETATION OF GRAVITY DATA

WEEKS: 13, 14  V.  MAGNETICS  
No class 11-11, (Wednesday)  
Veterans Day  
A. MAGNETIC FIELDS  
B. MAGNETIC FIELD OF THE EARTH  
C. MEASUREMENT OF GEOMAGNETIC FIELDS  
D. MAGNETIC SURVEYING  
E. PROCESSING OF MAGNETIC DATA  
F. MAGNETIC ANOMALIES  
G. MAGNETIC FIELD OF GEOLOGICAL STRUCTURES  
H. MODELING AND INTERPRETATION OF MAGNETIC DATA

No classes 11-25 through 11-29; Thanksgiving Break; classes resume on Monday, Nov 30th

WEEKS: 15  VI.  TOPICS SELECTED FROM:  
A. ELECTRICAL RESISTIVITY  
B. ELECTROMAGNETIC AND GEORADAR  
C. GEOPHYSICAL RADIOMETRIC MEASUREMENTS  
D. GEOPHYSICAL WELL LOGGING

EXAM #3: FINAL EXAM COVERING GRAVITY, MAGNETICS, AND SELECTED TOPICS  
(Dec 14th; 2:00pm-3:45pm)

Emergency Procedures:  
Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT's website at www.bert.siu.edu, Department of Safety's website www.dps.siu.edu (disaster drop down) and in Emergency Response Guideline pamphlet. Know how to respond to each type of emergency.