UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF GEOSCIENCE
COURSE OUTLINE
WINTER 2015

1. **Course:** Geophysics 557, Multidimensional Data Analysis and Processing

   Lecture Sections:

   L01: MoWeFr, 09:00-09:50, PF 114
   Instructor, Dr. J. Bancroft, Office ES 108, Tel. No. 403-220-5026, e-mail address, bancroft@ucalgary.ca,
   Office Hours: MWF 1:00 to 2:00 pm

   Geoscience Department ES 118, 403-220-5841, geoscience.ucalgary.ca, geoscience@ucalgary.ca

2. **Prerequisites:** Geophysics 517. See section 3.5.C in the Faculty of Science section of the online Calendar (www.ucalgary.ca/pubs/calendar/current/sc-3-5.html)

3. **Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments and Quizzes	20%
Laboratory experiments	30%
Midterm test	20%
Take-home test	20%
Final test	10%

Letter Grade	**Percent**
A+	95-100
A	86-94
A-	80-85
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	55-59
D	50-54
F	<50

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in Section 3.6. It is the student's responsibility to familiarize himself/herself with these regulations. See also Section E.6 of the University Calendar

5. **Course Materials:** Assigned in class

6. **Examination Policy**: No electronic or written aids (eg. cell phones, tablets, computers, PDAs, notes, textbooks) will be allowed during writing of any exams. Non-programmable calculators will be permitted to answer quantitative questions on exams, if applicable, and permission to do this will be clearly indicated on the examination paper. A take-home exam or quiz is open book.

   Students should also read the Calendar, Section G, on Examinations.

7. OTHER IMPORTANT INFORMATION FOR STUDENTS:

(a) Misconduct: Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties.

(b) Assembly Points: In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.

(c) Academic Accommodation Policy: Students with documentable disabilities are referred to the following links: Students with Disabilities: http://www.ucalgary.ca/pubs/calendar/current/b-1.html B.1 and Student Accessibility Services: http://www.ucalgary.ca/access/.

(d) Safewalk: Campus Security will escort individuals day or night (http://www.ucalgary.ca/security/safewalk/). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) Freedom of Information and Privacy: This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also http://www.ucalgary.ca/secretariat/privacy.

(f) Student Union Information: VP Academic Phone: 220-3911 Email: suvpaca@ucagary.ca.
SU Faculty Rep. Phone: 220-3913 Email: sciencerep@su.ucalgary.ca; Student Ombudsman

(g) Internet and Electronic Device Information: You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

(h) U.S.R.I.: At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference – please participate in USRI Surveys.

Department Approval: Original Signed Date: January 19, 2015

Associate Dean's Approval for
Alternate final examination arrangements: Original Signed Date: January 16, 2015

Lectures for GOPH 557 Seismic Data Analysis 2015

12 January 2015

Lec. 1	M 12 Jan	Intro, texts, Processing overview,
Lec. 2	W 14 Jan	Tools: Review sig proc, convolution, corr, decon, filtering, Lin. algebra
Lec. 3	F 16 Jan	Tools: Fourier transform (FT), 2D FT, FFT
Lec. 4	M 19 Jan	Tools: Aliasing, Properties of the 2D FT, dips
Lec. 5	W 21 Jan	Tools: Radon transforms
Lec. 6	F 23 Jan	Tools: Linear algebra
Lec. 7	M 26 Jan	Tools: First second derivatives, partial derivatives
Lec. 8	W 28 Jan	Tools: Finite-difference operators, accuracy
Lec. 9	F 30 Jan	Tools: Scalar wave equation (SWE)
Lec. 10	M 2 Feb	Waves, modes, rays, velocities (1), Snell' law, app. vels, p, linear V(z)
Lec. 11	W 4 Feb	Seis. acqu, 2D design, srce records, CMP gathers, stacking charts, 3D
Lec. 12	F 6 Feb	Velocities, instantaneous, average, mean, interval, RMS, group, phase
Lec. 13	M 9 Feb	Estimating velocities, semblance, velocity stacks
Lec. 14	W 11 Feb	Normal moveout correction (NMO), 2D, 3D,
Lec. 15	F 13 Feb	NMO stretch, mutes, stacking
	MWF	Reading week, Family day
Lec. 16	M 23 Feb	Near surface, refraction, subsurface models, datum, statics, up-hole times
Lec. 17	W 25 Feb	Statics, field, residual, surface consistent, 2-4 params, time shifting
Lec. 18	F 27 Feb	Midterm
Lec. 19	M 2 Mar	Noise, random, coherent, attenuation, filters, FK plots
Lec. 20	W 4 Mar	Multiples, mode conversions, removal, Radon, SRME
Lec. 21	F 6 Mar	Surface consistent processing, statics, amplitudes, decon.,
Lec. 22	M 9 Mar	Location of reflections, Fresnel zones, intro to poststack mig
Lec. 23	W 11 Mar	Pre-post stk p= , ray tracing,
Lec. 24	F 13 Mar	Raytracing mig, , dip, smoothed vels, time vs depth, constant velocity
Lec. 25	M 16 Jan	Shadow zone, const. vel., circles, formula, Huygen's P. Migration dip
Lec. 26	W 18 Mar	Impulse response, superposition of diffs, wavefronts
Lec. 27	F 20 Mar	Exploding reflector model, imaging condition, FK mig
Lec. 28	M 23 Mar	Depth stepping DC, FK mig
Lec. 29	W 25 Mar	FK mig, evanescent boundary, sinc interpolator, FK wavefield extrap.
Lec. 30	F 27 Mar	Phase shift, recursive wavefield extrap.,
Lec. 31	M 30 Mar	Recursive extrap for V(z), derivation of extrap. from WE, FT, up down
Lec. 32	W 1 Apr	Extrap as convolution, t-z conversion, aliasing, time and depth migs
	F 3 Apr	Good Friday
Lec. 33	M 6 Apr	Time and depth, Kirchhoff mig, integral, ray tracing,
Lec. 34	W 8 Apr	Kirchhoff integral, raytracing from scatter point, surface, wavefld extrap
Lec. 35	F 10 Apr	PSPI from Taylor series, Why prestack migration, prestack depth mig
Lec. 36	M 13 Apr	Review Take-home test
Lec. 37	W 15 Apr	Final test