Field slips (maps)
Field slips represent the basic method of recording geological information. They must be kept neat and legible: messy field slips lose marks.

a) Carry your field slips in a waterproof plastic bag (gallon zip-lock bags are fine), clipped on a hard map-board or case to prevent creases or rips.

b) Dry your hands when necessary before writing on your field slips. Store field slips in a dry place – under your raincoat or in your backpack if rain is persistent.

c) All entries on your field slips should be made with a sharp, hard lead pencil (#3-4). Carry a pencil sharpener to keep a fine tip on your pencil. Mechanical pencils with HB lead also work well.

d) Don’t write too heavily; remember that at a 1:10,000 scale, a 1mm thick line is equivalent to 10 meters on the ground.

e) Assign colors to each lithology in your field area (and record this in your field book). Mark the location (in the appropriate color) on your field slips of outcrops where any observation is made.

f) Record on your field slip as many structural readings as reasonable (i.e. legible) spacing allows. They should be oriented accurately, using a bar to indicate strike, and a tick on the down-dip side that touches the exact position where the reading has been taken. The amount of dip (0-90 degrees) should be indicated near the tip of the tick.

g) ‘Inking in’ is essential each night, so that penciled information is not lost through rubbing or getting wet in the field the next day. A .05mm (005) mapping pen should be used. All observations should be inked over (i.e. structural data, contacts, faults, etc.) Different symbols should be used for different structural fabrics (e.g. bedding vs. foliation).

h) Interpolate boundaries between all of your different rock units, using solid lines for exposed boundaries only. Use dashed lines for inferred contacts.

i) **Lightly** color in all outcrop areas after inking in. This makes your map easier to comprehend for the next day’s work. Use heavier color for the outcrops and lighter color for unexposed, but inferred lithology. Keep an index of all colors, symbols and abbreviations used in your field books and on the back of your field slip.

j) It is strongly advised that, each evening, you also copy the day’s new information from the working field slip onto an office-copy map that you keep in a safe place indoors. It is not uncommon for field slips to be blown away, to fall in streams, or to become too saturated with rainwater for further use. Take care to transfer data consistently from field slips to office copies.
BE NEAT AND METHODICAL in compiling information on your field slips. They are the basis of your entire mapping project.

Field notebooks
Field books should be of good quality with a hardback, waterproof binding. A surveyor’s level book is ideal; soft-cover secretarial pads are not adequate. Write your name and your address on the inside cover. Keep an index of your field projects on the 1st page: most field books have an index page for this purpose. In addition to your field slip, your field book is the primary place to record information while you are in the field. You should record data and observations from every outcrop you have visited in your field book. Any measurements you take should be recorded in your field book as well as plotted on your map. Consider your field book as a backup source of all of the data and information you put on your map. Typical information recorded in your field book for each outcrop visited might include: lithological description (see below), structural measurements (see below), fossils present, mineralogy, weathering and geomorphic features, etc. Obviously, if the same rock type is repeatedly observed along a traverse, there is no need to repeat the same detailed description for each outcrop, but note any variations or additional features.

Ensure that you write legibly in your field books. You will refer back to these notes many times during each of your mapping projects. And remember that we will also be grading your field books along with your other mapping project materials.

You should start a new page in your field book for each field day. At the top of the page, note the date and time, the location of your fieldwork, the current weather conditions, and your partners (if any). It is helpful to summarize briefly your plan of work (or field exercise, field trip, etc.) for that day. The main purpose of this is to help you remember that day’s work in the future, so any distinctive information can help (i.e. “I fell in the bog this morning…”). Likewise, it is helpful to summarize thoughts or nagging questions at the end of each day’s field work. Don’t hesitate to record ideas and working hypotheses about the structure and stratigraphy, etc. of your area while you are in the field. Sometimes those thoughts can help you when the time comes to write your summary of the mapping project.

Sketches
All good field notebooks include many sketches of all scales and sizes. Sketches should be made wherever you want to record an important feature and are especially helpful to illustrate lithological and structural relationships. When making sketches remember to record the orientation of the item of interest (e.g. “south-facing wall”, or a north arrow) and include a scale bar. Sketch maps of small, complex areas and/or regional overviews can be particularly useful. The most common deficiencies in students’ field books are the lack and/or poor quality of sketches. It is virtually impossible to have too many sketches in your field book.
Structural measurements
All structural data should be plotted on your map and clearly recorded in your field book. Through there are various standards for recording structural data in field books, we will use the following formats for this field course:

Strike & dip (planar features like bedding, foliation, etc.):
3-digit strike, 2-digit dip, dip direction e.g. 030, 45 S
(We recommend that you get comfortable with using right-hand-rule, i.e. measure your strike azimuth with the planar surface dipping down to your right.)

Plunge & trend (linear features, recorded in down-plunge direction):
2-digit plunge -> 3-digit trend e.g. 45 -> 030

Rake (a linear feature on a planar surface):
2-digit rake, rake direction e.g. 45 S

Note that a rake measurement is useless unless you also measure the strike and dip of the planar surface that contains the rake measurement. Use S₀ for bedding, S₁, S₂, etc. for foliations, and L₁, L₂, etc. for lineations. Ask your instructors or refer to Compton (“Geology in the Field”) if you have questions about how to record measurements on your maps.

It is advisable to compile structural readings each evening on stereonet plots. These stereonet plots may reveal regional trends that are not obvious at outcrop scale in the field. Plus, this will give you a leg up when it comes time to turn your completed mapping projects.

Rock lithologic descriptions
1) Igneous rock identification and description
Igneous rocks are identified in the field according to their texture and mineralogy; only fresh, unweathered surfaces can safely be used to indicate true color. For intrusive rocks, texture, whether coarse-, medium-, or fine-grained, depends on the form of the intrusion, which should be mapped as far as exposures permit. Any textural variations across the intrusion from margin to center should be carefully noted. Margins of intrusions bear particularly close examination, to discern chilling, flow-bandng, phenocrysts and/or xenoliths, etc. Mineralogical layering may be identifiable in larger intrusions.

Hypabyssal igneous rocks require measurement of their orientation in 3D-space. For dikes, record strike & dip and width. For sills, record thickness, strike & dip (if possible), and degree of conformity to bedding/structures in the host rocks. Any internal structures such as jointing or mineral/vesicle banding should be recorded.

Volcanic rocks follow the law of superposition and can be mapped on this basis (much like a sedimentary bed). Basalts can usually be identified from their dark color and high density. They are commonly vesicular and can have distinctive morphologic features, such as pillows. It is often advantageous to indicate these features on your maps, as they can be good indicators of a particular unit. Note that tuffs (volcanic ash deposits) are often difficult to distinguish in the field from fine-grained sedimentary rocks. Keep an open mind and use multiple working hypotheses.
2) Sedimentary rock identification and description
Factors to be noted for sedimentary rocks include number of beds, bed thickness, lithology, grain size, internal structures, and fossils. Field characterization of lithology should incorporate broad terms such as sandstone, limestone, shale, etc., as well as distinctive compositions (e.g. serpentine, jasper, etc.) Grain size can be classified as: boulders, cobbles, pebbles, coarse-fine sand, silt and clay. Shape (angular vs. rounded) and sorting of grains can also be important. Distinctive sedimentary structures include graded bedding, dewatering structures, and cross-bedding. Sedimentary structures can often be used as way-up indicators and may provide other information like paleocurrent direction. Fossils should be noted, characterized and sketched when necessary. When logging sedimentary sections, all of the above features should be noted in the log along with their characteristic location in the sedimentary column. Graphical representations of these features can often be helpful. All of this data will ultimately be useful in determining the depositional environments of your sedimentary section.

2) Metamorphic rock identification and description
Metamorphic rocks are characterized by mineralogy and texture. It is often useful to assign a provisional name in the field, even if it is only a general term like “garnet-mica schist”. List the physical characteristics of the rock: presence (or absence) of foliation or banding, hardness, color, etc. Record the presence of spots even if you can’t identify the porphyroblasts, which can be very small and/or weather out of the surface. Record and describe all foliations: planar vs. wavy, penetrative vs. spaced, etc. Pay particular attention to the mineralogy (type as well as size), as porphyroblasts can provide important information about the P & T conditions during metamorphism. Note the relationships between metamorphic phases and structural features, as well as any evidence of partial melting and migmatization. Color can sometimes be helpful, as in “greenschist” (basalts turn green after metamorphism) and “blueschist” (blue color from the minerals glaucophane and lawsonite from HPLT metamorphism).