Capstone Project
Guidelines – Specialization in Petroleum Geology

Purpose: The Capstone Project is intended to be somewhat like a mini-thesis with slightly different objectives. First, it serves as a final research project for the petroleum geology program. Secondly, it gives students an opportunity to integrate their newly learned skill-sets and methods with their exposure to various types of datasets in the program curriculum and on the job. This allows them to design and execute an integrated project with a reasonable conclusion or recommendation based on the available data, tools and skill sets. This makes the Capstone Project somewhat like the first step an oil professional would take after completing a degree with a Masters thesis. The Capstone is a developmental jump ahead of a thesis since the student completes a project report and data review similar to what would be expected of them on the job.

Capstone projects may cover a wide-variety of topics, but for the Specialization in Petroleum Geology, field studies or elements of field studies would be excellent for the Capstone Project. Regional studies or the development of play fairways and play concepts would also be appropriate as long as the student is careful not to create a project that is too large to complete in the time allotted. The key is to use readily available data and to apply skill sets learned throughout the degree program. Published data from the literature can be used but it is also hoped that many students will be able to get data sets from their employers, public data sets or as a last step from their UH advisors. The idea is that the student takes the initiative and ownership of their research project by formulating a research project.

In the past many of the capstones have been very successful projects that have recommended prospects that were drilled for the recovery of large volumes of hydrocarbons or that allowed the official booking of reserves. Others have worked on cross-plotting attributes to find significant "sweet" spots to high-grade plays in new parts of already producing basins. Still some other capstones have found negative results and recommended to drop exploration or further development in their area of study. This would result from the student's revelation of negative reservoir or geologic properties that would waste investment of time and money.

Scale of Project: The most critical limiting element in the Capstone is the time constraint. Projects should be doable with two-three months at a half-time effort. Consequently, the data must be readily available. There is no time for this type of project to wait for the acquisition of new data or extensive data processing of old data. The best type of data would be data that has been analyzed and previously used for a study with open questions remaining regarding the interpretation or meaning of some of the datasets. Datasets in publications would be appropriate if a question or problem about that dataset could be formulated and analyzed. Especially for geology capstones, data from new

sources or tools that have not been used previously to evaluate a particular prospect or play can be shown to enhance the recognition of important reservoir or non-reservoir properties within a study area by the use of these new tools.

Data acquisition and database manipulation can constitute a large part of the time spent on completing a project in the real world. Consequently, we prefer students to show their resourcefulness in obtaining data for a problem they want to work on for their capstone. The project is theirs and we like to see students take ownership of the project as much as possible so that it is not just another assignment laid out to them by their advisor. Whether data is from a company, a public data set or an advisor, the student needs to pay attention to what is needed to solve the problem they have chosen to address in this research.   The student should ask. Why am I doing this? What do I need at a minimum to answer this question? What can I do to make the size of this project manageable in the time I have to do it?

The size or scope of the study generally should be at the field scale. If the student can get data on play fairways or exploration trends and evaluate one or more critical elements that would be appropriate. Also, students could critically review previous field studies or play fairways to shed light on the validity or strength of various elements of a play definition or a field delineation based on technology and skill sets the student has acquired during the course of the masters curriculum. Studies illustrating the value of new data/methods versus old data/methods would also be appropriate.

Timing of the Project: Students should consider the topic they are interested in researching somewhere around courses 6-8. At the same time they should be identifying their advisor. Research always takes time and each process requiring a written document will require time to edit. As such, deadlines are not the dates at which you simply turn something in and an automatic grade is calculated. To evaluate research and the communication of that research, your advisor will need to have time to edit. Editing takes time if done well and even longer if the writer is unskilled or does not follow the guidelines herein.   Hence, the deadlines are when the process needs to be completely done. This includes editing and navigating your busy schedule and your advisor's schedule.   If you think something will delay you, you need to schedule time around that delay so that you will still finish in time without dumping your "deadlines" on your advisor. As such, the deadlines below should be considered absolute. The actual dates will be provided prior to the start of your final semester.
1. Begin considering capstone project topic and advisor: Roughly around the 6- 8th course in your curriculum.
2. Submit Proposal: Approximately 10 weeks prior to the date grades are due.
3. Approval of Proposal: Approximately 8 weeks prior to the date grades are due.
4. Turn in your final draft of capstone to your advisor: Approximately two weeks prior to thedate grades are due.
5. Present your capstone: Approximately one week prior to the date grades are due.
6. Final approval of capstone and grade posted: The date grades are due.

As mentioned on the last page, editing will take place between items 2 through 6 at each step. So the better you write and follow formatting suggestions the quicker this process will go. Again, if you or your advisor are busy with other tasks at this time, you will need to submit drafts sooner rather than on those dates.

Corporate Involvement: Companies that would like their employees to work on in-house problems are encouraged to do so. The Capstone Project is intended to prepare the students for real project work in companies. If the student can work on a well-defined company problem with stated objectives it would be an excellent topic for a Capstone but the student needs to take control of the outcomes expected to show they know the reason for the project and the need to understand the expected or predicted outcomes.   If the company requires confidentiality we can accommodate any level of confidentiality required as long as the advisor is allowed to openly review the data sets and evaluate the actual level of participation by the student.   We want to insure that the student can complete the project in the limited amount of time and also that it is the student's work that we are evaluating and not that of others from their employer. In such cases, the students need to perform their work on company facilities to avoid licensing conflicts of interest for software donated to the Department.

Capstone Project Proposal

Proposal Format: The following format is suggested for the proposal and the capstone write-up but can be modified to fit a specific project. As a writing-style guide for both the proposal and the final report please refer to a recent <u>AAPG Bulletin</u>, <u>Journal of Sedimentary Research</u>, or <u>Interpretation</u> to see the punctuation, reference, citation, etc. styles for manuscripts. Students may also opt for one of the SEG journals. In either case, pick one journal and stay consistent. USE their instructions for manuscripts. Do not make it look like a printed page with a channel and two columns. All manuscripts should be double-spaced for ease of editing in paper form and number the pages. The proposal is intended to provide a bit of learning on how to write a good paper. This small-scaled part of the capstone process allows you and the advisor to review a small work to be sure your writing skills are on target relative to an industry/academic audience. As such, what is suggested for the proposal below, should be elaborated in more detail for the final capstone.   The capstone of course should have your conclusions or recommendations and either of those must be supported by literature references and data. Each header section below should have 2 to several paragraphs depending on the details of your capstone subject. In some cases this could be longer or briefer. The point is to communicate your proposed project on all key points.

Header 1 – Introduction:
Write what it is, where it is, and briefly mention past related work. This does not have to be site specific. For example, an analogy

from a nearby play or play fairway and its relevance to your study area could be very important where nothing has previously been written. Also, whatever special, unique, or prevalent technology you may be using in your analyses could be explained or referred to in the literature. Here is where you should consider a map of the area of study and a stratigraphic column.

Header 2 − Problem or Objective of Project:
Be clear about what problem or question the project is attempting to solve. Why is it important and whether it is an economic question or or a technology question that needs to be resolved?

Header 3 − Data:
Data to address the objective will be listed with regard to its type, source, and most importantly its availability. A Capstone Project has a time limit element to it just as project work does in industry. Therefore, students should be able to demonstrate they will be able to obtain the data needed for their project within a portion of the overall project time frame. Resourcefulness on the part of the student to obtain an appropriate data set is very important.

Header 4 − Timing and Workflow Model:
Provide your timing giving your project, your schedule, your advisors schedule and the deadlines. Use something like attached Gantt chart or work-flow model with dates indicating timing of individual task completion.

Header 5 − Expected Outcome:
Given the dataset, the problem and issues, what will be the expected result(s) of this effort? You have stated a problem in Paragraph 2 and the economic purpose. Suggest one or several outcomes you could expect at the end of your study. These would be like hypotheses. "We expect to find?" This could be one or several possibilities which in some cases could be weighted as least likely to most likely, etc.

Header 6 − References:
Unless you have discovered everything you are writing about you need to make references through citations of papers that explain the regional geology and methods where appropriate. It is a good idea to do this in your proposal to learn the procedures in a document smaller than your final capstone. If you learn how to get this right in the proposal, editing will be more efficient in the larger final capstone document.

Header 7 – Figures for Proposal:
Most proposal should have a figure showing the area of study. If this is a confidential dataset than certain locational indicators may be removed if necessary.   With seismic data some layout of the acquisition grid should be shown if possible.   For geology a stratigraphic chart and a study area map are always required but may or may not be appropriate in a geophysics capstone.

Committee structure for proposal above and capstone project below:
The only requirement is that you must have at least one faculty member from the Professional Program or faculty as committee chairman. All other members are optional and can be from the department, the university, government, academia, or industry. The number of committee members or participants in the defense is set by the student who may receive input from their company, but the minimum is one UH faculty advisor.

Capstone Project Report

Deliverables: Each student will need to present their results as an oral report (**1**) and a written document (**2**). These are discussed in more detail below.

1. **Write-up and Format:** The Capstone written report should have several sections or chapters. The final report will be written and an oral presentation (see below) will be made. Target lengths listed here for a capstone should considered a minimum length for the **r**eport of about 10 double-spaced pages. A lot of information would need to be conveyed in those ten pages if you go by the minimum. **There is no set maximum length** but generally it is not necessary to exceed 25 double-spaced pages of text with additional figures, maps and appendices. If you are counting pages, you are not focusing on communicating the problem or results. The format should be similar to the guidelines listed below.

Section I: Executive Summary
Section II: Statement of Problem and Initial Objectives
Section III: Background of Study Area and Technology or Methods
Section IV: Results of Study or Analyses
Section V: Conclusion or Recommendations
Section VI: References
Appendices: Proposal will be Appendix 1 but will be submitted in advance of the final write-up per semester deadlines. Charts, Maps, Seismic Sections will be additional appendices.

2. **Presentation and Format:** The presentations will be approximately 20 minutes long with focus on results, conclusions, and recommendations. You may use either of the following for an oral presentation.

Poster Presentation: Up to 4 posters and maps can be used during the oral presentation.

PowerPoint Presentation: PowerPoint presentations with less than 30 slides covering the topics listed in the write-up and format for the report.

Audience: This is largely up to the student because of potential confidentiality issues. The preferred audience would be to invite all professional program professors, students and committee members. However, only the committee members (at least one, your advisor) must attend and the director of professional programs must be invited.

Therefore, additional attendees will be at the discretion of the student or on the basis of confidentiality agreements pertaining to the datasets used by the student. The director of the professional programs will provide feedback on necessary steps for completion in an advisory capacity to the actual Capstone Advisor and committee if there are others on the committee.

Grading: A letter grade will be applied.