Detailed Assessment Report
As of: 10/05/2012 07:44 AM EST
2011-2012 Hydrographic Science MS**

Mission / Purpose

The purpose of the M.S. program in Hydrographic Science is to provide students with technical and practical expertise in advanced hydrographic methods and standards that will enable them to assume leadership roles in using modern techniques in academic, government, military, and private organizations engaged in hydrographic activities.

Student Learning Outcomes/Objectives, with Any Associations and Related Measures, Targets, Findings, and Action Plans

SLO 1:BATHYMETRY

1.1 Underwater Acoustics. Students will describe or explain the principles of underwater acoustics to include the sonar equation, the generation of acoustic waves, propagation loss, the effects of the physical properties of water on sound speed, ray path theory, the effects on reflection and echo strength due to characteristics of the seafloor, the effects of noise and directivity on echo sounding and sonar ranges, and the performance of sonars and acoustic devices based on specific system parameters. 1.2 Single-beam Echo sounders. Students will describe or evaluate how single-beam echo sounders work and are used in hydrography to include: different types of transducers, CW and chirp transmission, transducer mounting, analog and digital data recording, interpretation of data, accuracy and uncertainty of measurements to include all sources of errors, acoustic sweeps, and the selection of appropriate echo sounders based on system characteristics. 1.3 Side-scan Sonars. Students will explain or determine the principles and geometry of side-scan sonars and how these sonars are used in hydrography to include: the effect on performance due to frequency, beam angle, range scale, gain, towing speed, towing height, and mounting deployment; to determine the sources of image distortion; to position, interpret, and mensurate sonar contacts; and to create and analyze mosaics and seafloor topography. 1.4 Multibeam and Swath Sonars. Students will explain or determine the principles and geometry of multibeam echo sounders and how these sonars are used in hydrography to include: multibeam transducers and signal processing - transmit and receive arrays, beam forming and beam steering, and the effect of aperture size and element spacing on performance; the techniques used in bottom detection; determining depth coverage and depth uncertainty based on sonar characteristics, positioning and motion sensors, operator settings, and vessel speed; the calibration of multibeam systems with respect to the vessel reference frame and the determination of all position and depth uncertainties using the patch test; and establishing a reference surface. 1.5 Phase Differencing Bathymetry. Students will describe or explain the principles and geometry of interferometry and phase differencing bathymetric sonars and how these sonars are used in hydrography to include: the benefits and effects of multiple arrays in a phase differencing system, options for deployment and mounting, and specific applications. 1.6 Non-acoustic Bathymetric Techniques. Students will describe or explain the principles and capabilities of non-acoustic techniques and how these techniques are used in hydrography to include: laser bathymetry - differences between topographic and bathymetric lidar, system performance due to operational and environmental factors, and bottom detection techniques; passive and satellite remote sensing; mechanical techniques; and the use of inspection techniques.

Connected Document

- *FIG/IHO/ICA Standards of Competence for Hydrographic Surveyors*

Related Measures:

M 1:Employer Survey

Employers will be polled to determine level of understanding and preparedness of alumni. Evaluation will be based on Employer Evaluation Instrument responses.

Source of Evidence: Employer survey, incl. perceptions of the program

Target:
90% of employer respondents feel that their graduates have a good understanding of hydrography and are in favorable positions to move forward in their careers. Evaluation will be based on Employer Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (significantly below peers to substantially above peers), with an average of 3 (same as peers) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Employer survey not due at this time.

M 5:Practical Exercises (MAR 668, HYD 601, & HYD 605)

Students will complete individual practical exercises dealing with acoustic theory in several courses (MAR 668 - Acoustics, HYD 605 - Applied Bathymetry, and HYD 601 - Hydrographic Data Management). The exercises will include: Acoustic wave transmission, reception and propogation; transducer design; ray tracing; and sound velocity measurement and application.

Source of Evidence: Performance (recital, exhibit, science project)

Target:
90% of students will successfully complete, on the first try. A grade of B and above, for each practical exercise, is considered to be successful.

Findings (2011-2012) - Target: Partially Met
For MAR 668, 10 of 13 students completed all practical exercises with a B or better on the first try. For MAR668; several students identified particular challenges with programming and Matlab. These deficiencies were addressed in the class. We are still working on plans to better address programming/Matlab issues. One plan is to develop a series of U-Tube tutorials that specifically address the programming and Matlab needs. For HYD 601, six of seven practical exercises involved aspects of bathymetry. Thirteen of 13 students successfully completed all practical exercises with a B or better on the first try. For HYD 605, two of three practical exercises involved aspects of bathymetry. Eleven of eleven students achieved a grade of B or above on both exercises, although the second exercise required a second submission to comply.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise sequence of courses
Established in Cycle: 2010-2011
Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:
90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 10 stated outcomes separately (bathymetry, water levels,

positioning, hydrographic practice, hydrographic data management, environmental science, nautical charting, legal aspects, remote sensing, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Partially Met
This entry is in error but cannot be deleted. Correct entry is below.

Findings (2011-2012) - Target: Partially Met
Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report.

M 10:Alumni Survey

Alumni will be interviewed within one year of graduation to determine the suitability and currency of presented material. 90% of alumni, questioned within one year of graduation, will feel that their learning was based on up-to-date information, and is relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. This evaluation instrument will be comprised of questions that specifically address all learning outcomes.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:
90% of responding alumni, questioned within 10 years of graduation, will feel that their learning was based on up-to-date information, and was relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (far below needs to substantially exceeded needs), with an average of 3 (met needs) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
The Alumni survey is not due.

SLO 2:WATER LEVELS AND FLOW

2.1 Tidal Fundamentals. Students will describe tidal theories, major harmonic constituents, the concept of amphidromes, and co-tidal charts. 2.2 Tidal Measurements. Students will explain the various types of water level gages and their calibration and select appropriate instruments and locations for water level monitoring. 2.3 Tidal Streams and Currents. Students will describe or select the appropriate methods for measuring tidal currents. 2.4 Tidal Analysis and Prediction. Students will determine a preliminary sounding datum. 2.5 Tidal Information. Students will predict water levels at a particular time and place using tide tables, co-tidal charts they constructed, or numerical models. 2.6 Non-tidal Water Level Variations. Students will describe the temporal and spatial effects on water level caused by non-tidal factors and select appropriate locations for water level gages in areas affected by non-tidal variations.

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Related Measures:

M 1:Employer Survey

Employers will be polled to determine level of understanding and preparedness of alumni. Evaluation will be based on Employer Evaluation Instrument responses.

Source of Evidence: Employer survey, incl. perceptions of the program

Target:
90% of employer respondents feel that their graduates have a good understanding of hydrography and are in favorable positions to move forward in their careers. Evaluation will be based on Employer Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (significantly below peers to substantially above peers), with an average of 3 (same as peers) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Employer survey not due at this time.

M 6:Practical Exercises (HYD 612)

Students complete a series of individual and group practical exercises including: • Planning for deployment of a tide gage to NOS standards and report(Tides and Water Levels) • Installation of tide gage and report to NOS standards (Tides and Water Levels) • Datum transfer and harmonic analysis of data from tide gage and report (Tides and Water levels)

Source of Evidence: Performance (recital, exhibit, science project)

Target:
90% of students will successfully complete, on the first try, a series of individual and group practical exercises. A grade of B and above, for each practical exercise, is considered to be sucessful.

Findings (2011-2012) - Target: Met
Ten of 10 students successfully completed all exercises on the first try. These exercises included calibrating a tide gage, installing a tide gage, conducting a leveling loop, performing a datum transfer, and doing a harmonic analysis.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise sequence of courses

Established in Cycle: 2010-2011

Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:

90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 10 stated outcomes separately (bathymetry, water levels, positioning, hydrographic practice, hydrographic data management, environmental science, nautical charting, legal aspects, remote sensing, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Partially Met

Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report.

M 10:Alumni Survey

Alumni will be interviewed within one year of graduation to determine the suitability and currency of presented material. 90% of alumni, questioned within one year of graduation, will feel that their learning was based on up-to-date information, and is relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. This evaluation instrument will be comprised of questions that specifically address all learning outcomes.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:

90% of responding alumni, questioned within 10 years of graduation, will feel that their learning was based on up-to-date information, and was relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (far below needs to substantially exceeded needs), with an average of 3 (met needs) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle

The Alumni survey is not due

SLO 3:POSITIONING

3.1 Geodesy. Students will describe ellipsoids, gravity models, and predicted bathymetry from satellite altimetry; define the celestial sphere and geodetic systems, calculate transformations between co-ordinate reference systems; describe, evaluate and specify satellite positioning systems; calculate on the ellipsoid; evaluate and select the best positioning data filtering and cleaning procedures; and describe, transform or verify conformal and non-conformal projections, grid coordinates, scale factor, convergence, and arc to chord corrections. 3.2 Horizontal Positioning. Students will specify and plan horizontal control surveys, specify appropriate instruments, and understand logistical aspects; describe the principles of angular measurement instruments; describe the principles of distance measurement instruments; describe the principles of electromagnetic positioning systems; explain GNSS concepts and principles; evaluate and select appropriate methods, instruments and locations to limit uncertainties appropriate to specific applications; describe acoustic positioning concepts and specify deployment and calibration; catalogue sources and magnitudes of errors for each positioning method and system; and monitor system performance by analyzing least square adjustment results. 3.3 Vertical Positioning. Students will explain vertical positioning fundamentals; describe and establish the various vertical datums used in hydrographic operations; describe and evaluate methods and instruments for elevation measurements and computations; and describe the principles of heave compensation systems, heave data filters and select the appropriate one for specific applications. 3.4 Orientation. Students will describe the operation principles of orientation sensors; evaluate and select the appropriate orientation sensor for specific applications; and install, calibrate and analyze the data quality of orientation sensors. 3.5 Three-dimensional Geodesy. Students will describe the mathematical model for 3D Geodesy and the application of 3D Geodesy to hydrographic 3D positioning of survey platforms.

Connected Document

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Related Measures:

M 1:Employer Survey

Employers will be polled to determine level of understanding and preparedness of alumni. Evaluation will be based on Employer Evaluation Instrument responses.

Source of Evidence: Employer survey, incl. perceptions of the program

Target:

90% of employer respondents feel that their graduates have a good understanding of hydrography and are in favorable positions to move forward in their careers. Evaluation will be based on

Employer Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (significantly below peers to substantially above peers), with an average of 3 (same as peers) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Employer Survey not due at this time.

M 3:Practical Exercises (HYD 600, 601, and 604)

A series of individual and group practical exercises including: • Level line and report (HYD 600 Geodesy) • Traverse using a Total Station and report (HYD 600, Geodesy) • Static Global Positioning System (GPS) survey and report (HYD 600, Geodesy) • Virtual GPS project and report (HYD 600, Geodesy) • Kinematic positioning projects on land and on water, and reports (HYD 604, Kinematic Positioning and HYD 601, Hydrographic Data Management)

Source of Evidence: Written assignment(s), usually scored by a rubric

Target:
90% of students will successfully complete (grade of B or above), a series of individual and group practical exercises.

Findings (2011-2012) - Target: Met
For HYD 600, 11 of 13 students successfully completed all exercises on the first attempt, all students successfully completed all exercises on subsequent attempts. For HYD 601, understanding high-accuracy positioning techniques and demonstrating proficiency are integral to at least six of the seven practical exercises. Thirteen of 13 students successfully completed all exercise with a B or better. For HYD 604, 13 of 13 students successfully completed all three practical exercises with a grade of B or above. On two of these exercises, these results were achieved on the first attempt. One of these exercises was complex enough to require three iterations for all students to successfully achieve a grade of B, but these iterations were considered to be excellent learning opportunities.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise sequence of courses
Established in Cycle: 2010-2011
Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:
90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 8 stated outcomes separately (bathymetry, water levels, positioning, hydrographic practice, hydrographic data management, environmental science, nautical

charting, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Partially Met

Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report.

M 8:Electronic Nautical Chart

Successful application of the principals of geodesy where the student must merge several different data sets, with different coordinate systems, into standard charting horizontal and vertical datums, for the creation of an ENC (Electronic Nautical Chart).

Source of Evidence: Project, either individual or group

Target:

90% of students will be able to create an ENC, to international standards, on the first attempt. Any error in the ENC resulting from the incorrect application of the principles of geodesy, or by using the incorrect horizontal or vertical datum, is unacceptable.

Findings (2011-2012) - Target: Met

Nine of 9 students taking HYD 606 successfully created an ENC and paper chart which used the correct horizontal and vertical datums.

Related Action Plans (by Established cycle, then alpha):

For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

Revise sequence of courses
Established in Cycle: 2010-2011
Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

M 10:Alumni Survey
Alumni will be interviewed within one year of graduation to determine the suitability and currency of presented material. 90% of alumni, questioned within one year of graduation, will feel that their learning was based on up-to-date information, and is relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. This evaluation instrument will be comprised of questions that specifically address all learning outcomes.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:
90% of responding alumni, questioned within 10 years of graduation, will feel that their learning was based on up-to-date information, and is relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (far below needs to substantially exceeded needs), with an average of 3 (met needs) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Alumni survey is not due.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure
Established in Cycle: 2005-2006
An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

SLO 4:HYDROGRAPHIC PRACTICE
4.1 Types of hydrographic surveys. Students will describe the purposes and components of nautical charting surveys and related IHO survey specifications; describe the methods and instruments used in surveys to support port management and coastal engineering; and explain the principles and conduct of offshore industrial surveys including the role of ROV's in such surveys 4.2 Hydrographic specifications. Students will specify the appropriate bathymetric, oceanographic, geophysical, and geotechnical equipment required for specific applications and their appropriate location; create survey operations specifications for specific requirements; estimate costs and schedules; and create contract tender documents with specifications for all deliverables. 4.3 Routing. Students will explain line keeping; and evaluate and select the appropriate route guidance system for specific applications. 4.4 Data telemetry links. Students will explain the difference in radio data telemetry range and data capacity of various carrier frequencies and operational parameters; install and operate appropriate data telemetry links for specific applications; and explain and describe acoustic data telemetry links. 4.5 Digital signal processing. Students will describe basic signal and image processing concepts.

Connected Document

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Related Measures:

M 1:Employer Survey

Employers will be polled to determine level of understanding and preparedness of alumni. Evaluation will be based on Employer Evaluation Instrument responses.

Source of Evidence: Employer survey, incl. perceptions of the program

Target:

90% of employer respondents feel that their graduates have a good understanding of hydrography and are in favorable positions to move forward in their careers. Evaluation will be based on Employer Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (significantly below peers to substantially above peers), with an average of 3 (same as peers) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle

Employer survey not due at this time.

Related Action Plans (by Established cycle, then alpha):

For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure

Established in Cycle: 2005-2006

An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

Conduct survey of employers

Established in Cycle: 2009-2010

Identify employers then implement new survey of employers during June2010.

M 7:Field Project

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Source of Evidence: Capstone course assignments measuring mastery

Target:

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Findings (2011-2012) - Target: Partially Met

Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams

consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report.

Related Action Plans (by Established cycle, then alpha):

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Revise student learning outcomes

Established in Cycle: 2007-2008

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Robust equipment and software inventory

Established in Cycle: 2009-2010

Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

M 10:Alumni Survey

Alumni will be interviewed within one year of graduation to determine the suitability and currency of presented material. 90% of alumni, questioned within one year of graduation, will feel that their learning was based on up-to-date information, and is relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. This evaluation instrument will be comprised of questions that specifically address all learning outcomes.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:

90% of responding alumni, questioned within 10 years of graduation, will feel that their learning was based on up-to-date information, and was relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (far below needs to substantially exceeded needs), with an average of 3 (met needs) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Alumni survey not due

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure
Established in Cycle: 2005-2006
An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

M 11:Writing Assignments (HYD 605 and HYD 608)
90% of students will demonstrate their understanding of project planning and national and international standards by • Completing desktop survey design projects, including specifications, selection of equipment and survey procedures, cost plan, and scheduling, and report (HYD 605 - Applied Bathymetry). • Completing the Hydrographic Survey Specifications (HSS) for the field project (HYD 608 - Practical Hydrographic Science). They will then carry out the field project adhering to these specifications. They will also successfully complete a Report of Survey that describes how the specifications were met.

Source of Evidence: Project, either individual or group

Target:
90% of students will demonstrate their understanding of project planning and national and international standards. A grade of B and above, for each practical exercise, is considered to be sucessful.

Findings (2011-2012) - Target: Met
In HYD 608, 15 of 15 students obtained a B or better in all practical exercises. Six of 15 students, however, barely obtained a B on one practical exercise. For HYD 605, one semester-long practical exercise was to develop a comprehensive desktop survey plan for a proposed area to be surveyed during the summer semester. Eleven of eleven students were divided into four teams to develop four competing plans. Late in the semester, these were presented to a panel of instructors for both technical and written and visual presentation assessment. Two teams were graded above the other two teams, but all teams achieved a grade of B+ or above. The two highest ranked plans were adopted for the summer semester survey. Thirteen of 13 students were then divided into two teams to complete Hydrographic Survey Specifications (HSS) for their proposed summer project areas. The HSSs had to comply with international and national standards. Both teams successfully completed an HSS for their project areas.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Revise sequence of courses
Established in Cycle: 2010-2011
Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

SLO 5:HYDROGRAPHIC DATA MANAGEMENT
5.1 Real-time data acquisition and control. Students will collect hydrographic data by operating data acquisition and control systems; describe on-line data sampling, validation and selection techniques, and the effects of

gating and filtering parameters; and evaluate and specify data acquisition methods for specific applications 5.2 Analog data capture. Students will evaluate and select digital data capture equipment, formats, and strategies. 5.3 Data management, processing and analysis. Students will apply approximations and estimation procedures to survey measurements; evaluate and select the best filtering and cleaning procedures for specific applications; describe the properties and concepts of spatial databases, DBMS, GIS, SDI, metadata, and DEMs; select appropriate DEM types for specific applications; and explain and apply the use of GIS to marine environmental issues. 5.4 Data presentation. Students will perform plotting and contouring of hydrographic data and evaluate and select the best 3D modeling and visualization methods for specific applications.

Connected Document

- *FIG/IHO/ICA Standards of Competence for Hydrographic Surveyors*

Related Measures:

M 1:Employer Survey

Employers will be polled to determine level of understanding and preparedness of alumni. Evaluation will be based on Employer Evaluation Instrument responses.

Source of Evidence: Employer survey, incl. perceptions of the program

Target:

90% of employer respondents feel that their graduates have a good understanding of hydrography and are in favorable positions to move forward in their careers. Evaluation will be based on Employer Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (significantly below peers to substantially above peers), with an average of 3 (same as peers) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle

Employer survey not due at this time.

Related Action Plans (by Established cycle, then alpha):

For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure

Established in Cycle: 2005-2006

An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

Conduct survey of employers

Established in Cycle: 2009-2010

Identify employers then implement new survey of employers during June2010.

M 2:Practical Exercises (HYD 601)

Individual and group practical exercises in HYD 601. Successful completion of the exercises will only be possible if the student has a complete understanding of hydrographic data collection, processing and evaluation techniques.

Source of Evidence: Performance (recital, exhibit, science project)

Target:

90% of students will demonstrate their understanding of Hydrographic Data Management by successfully completing, on their first try, individual and group practical exercises in HYD 601. A grade of B and above, for each practical exercise, is considered to be successful.

Findings (2011-2012) - Target: Met

HYD 601 had seven practical exercises concerning writing Standard Operating Procedures for the

utilization of a particular piece of equipment or software procedure, collecting hydrographic survey data with a Reson multibeam and EdgeTech bathymetric side-scan sonar, high-accuracy GPS data collection, multibeam calibration, and data processing. Thirteen of 13 students successfully completed all exercises on their first attempt.

Related Action Plans (by Established cycle, then alpha):

For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes

Established in Cycle: 2007-2008

Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory

Established in Cycle: 2009-2010

Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

Revise sequence of courses

Established in Cycle: 2010-2011

Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:

90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 10 stated outcomes separately (bathymetry, water levels, positioning, hydrographic practice, hydrographic data management, environmental science, nautical charting, legal aspects, remote sensing, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Partially Met

Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a.

Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

M 10:Alumni Survey

Alumni will be interviewed within one year of graduation to determine the suitability and currency of presented material. 90% of alumni, questioned within one year of graduation, will feel that their learning was based on up-to-date information, and is relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. This evaluation instrument will be comprised of questions that specifically address all learning outcomes.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:
90% of responding alumni, questioned within 10 years of graduation, will feel that their learning was based on up-to-date information, and was relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (far below needs to substantially exceeded needs), with an average of 3 (met needs) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Alumni survey is not due

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure
Established in Cycle: 2005-2006

An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

SLO 6:ENVIRONMENTAL SCIENCE

6.1 Meteorology. Students will describe the vertical structure of the atmosphere, define meteorological elements, describe wind circulation and explain the relation with atmospheric pressure, describe climatology and the elements of weather systems, operate weather observing and recording instruments, interpret a synoptic chart, and describe the workings of the International Marine Meteorological service System. 6.2 Oceanography. Students will define and describe the physical properties of sea water in relation to depth and explain the effects of solar radiation; define marine circulation dynamics and the effects of friction; define the general circulation of the oceans and their driving mechanisms; define wave parameters and sea states and explain the relationship with wind; define wave propagation in coastal areas; describe oceanographic sampling methods and sensors; and use oceanographic instruments for specific applications. 6.3 Marine Geology and Geophysics. Students will define rock types, the structure of the earth, and seabed samplers; describe geomorphological structures and processes and their effects on the sea bed and continental shelf; describe the earth's magnetic field and geomagnetic surveys; describe the earth's internal structure, gravity fields, and gravity surveys; define the objective of reflection/ refraction seismic profiling and the equipment used; and describe geotechnical sampling and equipment; describe sediment deposition and erosion and the fluvial process; and outline the basic concepts of environmental impact studies.

Connected Document

- *FIG/IHO/ICA Standards of Competence for Hydrographic Surveyors*

Related Measures:

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:

90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 10 stated outcomes separately (bathymetry, water levels, positioning, hydrographic practice, hydrographic data management, environmental science, nautical charting, legal aspects, remote sensing, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Partially Met

Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team

dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

M 14:Examinations

Students will demonstrate their understanding of the effects of meteorological conditions on hydrographic survey operations; the effects of the physical properties of sea water, ocean currents and circulation dynamics, and coastal wave propagation on hydrographic survey operations; and the structure of the earth and requirements of geomagnetic surveys through written examinations.

Source of Evidence: Writing exam to assure certain proficiency level

Target:
90% of students will demonstrate understanding of the required concepts by passing examinations in MAR 561 (Physical Oceanography), HYD 602 (Marine Geology), and HYD 609 (Marine Science) with a B or better.

Findings (2011-2012) - Target: Met
All students passed examinations in MAR 561 and HYD 609 with a B or better. 10 of 11 students passed the HYD 602 examinations with a B or better.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008

Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

SLO 7:LEGAL ASPECTS

7.1 Product Liability. Students will explain the legal liability of the Hydrographer for their products. 7.2 Contracts. Students will incorporate contractual considerations in planning and specifying hydrographic products and services. 7.3 Law of the Sea. Students will describe the historical development of LOS and its influence on hydrographic surveying and marine scientific research; describe the nature and characteristics of delimitation zones; and design and specify surveys for LOS delimitation. 7.4 Marine Law. Students will describe the basic process of marine accident investigations and court cases related to hydrographic issues.

Connected Document

- *FIG/IHO/ICA Standards of Competence for Hydrographic Surveyors*

Related Measures:

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:

90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 10 stated outcomes separately (bathymetry, water levels, positioning, hydrographic practice, hydrographic data management, environmental science, nautical charting, legal aspects, remote sensing, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Met

Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors

that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report. Although the overall target was not achieved, the objective for legal aspects was met.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

M 13:Practical Exercises (HYD 603)
Students will demonstrate their understanding of product liability, contracts, Law of the Sea, and Marine Law through class discussion ans a final exam.

Source of Evidence: Writing exam to assure certain proficiency level

Target:
90% of students will actively participate in in-class discussions and achieve a grade of B and above on the final exam which is considered to be successful

Findings (2011-2012) - Target: Met
All students (11 of 11) successfully completed the final exam with a B or better and 10 of 11 received an A-.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

Revise sequence of courses
Established in Cycle: 2010-2011
Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

SLO 8:NAUTICAL CHARTING HYDROGRAPHY

8.1 Siting of Aids. Students will describe fixed and floating ATONS; identify appropriate locations and siting for leading lines and ATONS. 8.2 Publications Students will describe the hydrographic data required for nautical publications and prepare a narrative and other documents describing findings from a surveyed area for updating nautical publications. 8.3 Chart Reproduction. Students will outline the process of chart reproduction and explain the difference between offset printing and print-on-demand technology. 8.4 Correction of Charts. Students will explain the importance of chart updates, their dissemination, and the procedures used to maintain chart databases. 8.5 Chart Compilation. Students will select soundings, contours, and features from a hydrographic survey for compiling a nautical chart using digital cartographic methods and using good cartographic practices.

Connected Document

- *FIG/IHO/ICA Standards of Competence for Hydrographic Surveyors*

Related Measures:

M 1:Employer Survey

Employers will be polled to determine level of understanding and preparedness of alumni. Evaluation will be based on Employer Evaluation Instrument responses.

Source of Evidence: Employer survey, incl. perceptions of the program

Target:

90% of employer respondents feel that their graduates have a good understanding of hydrography and are in favorable positions to move forward in their careers. Evaluation will be based on Employer Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (significantly below peers to substantially above peers), with an average of 3 (same as peers) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle

Employer Survey not due at this time.

Related Action Plans (by Established cycle, then alpha):

For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure

Established in Cycle: 2005-2006

An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

Conduct survey of employers

Established in Cycle: 2009-2010

Identify employers then implement new survey of employers during June2010.

M 4:Practical Exercises (HYD 606)

Students will be able to demonstrate their understanding of Nautical Chart Production by creating paper and electronic charts through a series of individual and group practical exercises (Nautical Cartography and GIS). The individual exercises lead the students through the process; the group exercises ensure that the students understand the process and can complete the charts without instructor guidance. Successful completion of the field project will only be possible if the student has a complete understanding of Nautical Chart Production.

Source of Evidence: Performance (recital, exhibit, science project)

Target:
90% of students will be able to demonstrate their understanding of Nautical Chart Production by successfully creating paper and electronic charts, through a series of individual and group practical exercises (Nautical Cartography and GIS). The individual exercises lead the students through the process; the group exercises ensure that the students understand the process and can complete the charts without instructor guidance. Successful completion of the field project will only be possible if the student has a complete understanding of Nautical Chart Production.

Findings (2011-2012) - Target: Met
Nine of 9 students taking HYD 606 successfully created an ENC and paper chart.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

Revise sequence of courses
Established in Cycle: 2010-2011
Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:
90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 10 stated outcomes separately (bathymetry, water levels, positioning, hydrographic practice, hydrographic data management, environmental science, nautical charting, legal aspects, remote sensing, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Met
Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the

Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report. Although the overall target was not met, the objective for nautical charting hydrography was met.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

M 10:Alumni Survey

Alumni will be interviewed within one year of graduation to determine the suitability and currency of presented material. 90% of alumni, questioned within one year of graduation, will feel that their learning was based on up-to-date information, and is relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. This evaluation instrument will be comprised of questions that specifically address all learning outcomes.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:
90% of responding alumni, questioned within 10 years of graduation, will feel that their learning was based on up-to-date information, and was relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (far below needs to substantially exceeded needs), with an average of 3 (met needs) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Alumni survey is not due.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure
Established in Cycle: 2005-2006
An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

SLO 9:REMOTE SENSING

9.1 Coastline delineation. Students will use GNSS-based and ground survey techniques to delineate coastline features; explain the use of aerial photographs, different film, and the ortho-rectification process to map coastlines; and explain photogrammetric principles to determine topography. 9.2 Ice mapping. Students will characterize areas using optical reflectance, thermal emission, radar, and microwave emission. 9.3 Water surface mapping. Students will describe water surface mapping using lidar, altimetry, imaging radar, microwave radiometer, and thermal radiometer. 9.4 Bathymetric remote sensing. Students will describe lidar, radar altimetry, photogrammetric, and SAR methods to determine bathymetry and process remotely sensed data from one method to determine bathymetry. 9.5 Water column properties. Students will explain water column properties and detection of upwelling from SST.

Connected Document
- *FIG/IHO/ICA Standards of Competence for Hydrographic Surveyors*

Related Measures:

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:
90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 10 stated outcomes separately (bathymetry, water levels, positioning, hydrographic practice, hydrographic data management, environmental science, nautical charting, legal aspects, remote sensing, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Met
Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team

dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report. Although the overall target was not met, the objective for remote sensing was met.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

M 12:Practical Exercises (HYD 611)
Students will demonstrate their understanding of coastline delineation, ice mapping, water surface mapping, bathymetric remote sensing, and remotely sensed water properties through practical exercises, written assignments, and tests.

Source of Evidence: Written assignment(s), usually scored by a rubric

Target:
90% of students will successfully complete, on the first try, a series of individual and group practical exercises and written assignments. A grade of B and above, for each, is considered to be successful.

Findings (2011-2012) - Target: Met
HYD 611 had three practical exercises: Stereo Viewer Photo Exercise, Multispectral Image Processing Exercise, and a Shoreline Delineation Exercise. Thirteen of 13 students did very well on the first and last exercise but only one student received a B or better on the 2nd exercise. Steps will be taken to make the 2nd exercise more understandable. Nevertheless, overall the target was met.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

Revise sequence of courses
Established in Cycle: 2010-2011
Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

SLO 10:PROJECT MANAGEMENT AND LEADERSHIP

10.1 Students will understand all of the processes necessary to plan, carry out, analyze, and evaluate a hydrographic survey and to develop a survey plan from the hydrographic survey specifications and make adjustments to this plan as warranted by field conditions. 10.2 Students will take the role of a Party Chief and oversee all aspects of a hydrographic survey or take the role of Subject Matter Expert on a particular task. 10.3 Students will develop work schedules and personnel assignments and manage logistics and communications. 10.4 Students will understand the aspects of group dynamics and group leadership, interact with others within a group, and understand how to rely on others to accomplish a survey project.

Related Measures:

M 1:Employer Survey

Employers will be polled to determine level of understanding and preparedness of alumni. Evaluation will be based on Employer Evaluation Instrument responses.

Source of Evidence: Employer survey, incl. perceptions of the program

Target:
90% of employer respondents feel that their graduates have a good understanding of hydrography and are in favorable positions to move forward in their careers. Evaluation will be based on Employer Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (significantly below peers to substantially above peers), with an average of 3 (same as peers) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Employer Survey not due at this time.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure
Established in Cycle: 2005-2006
An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

Conduct survey of employers
Established in Cycle: 2009-2010
Identify employers then implement new survey of employers during June2010.

M 7:Field Project

Demonstrate understanding of geodesy, tides, acoustics, data management, chart production, project planning, project management, and leadership during the Comprehensive Oral Exam. This Exam is a presentation of the results of the field project. The field project is a complete hydrographic survey conducted by the class with minimal input from instructors. Students plan and execute the survey, and then process and evaluate the data, and produce a paper and digital chart. The students deliver the data and charts, along with a Report of Survey, to the National Ocean Service (NOS) for assessment. They also present the results of this survey to a review panel made up of the program instructors. The entire field project process is designed to follow the procedures of an official hydrographic office.

Source of Evidence: Capstone course assignments measuring mastery

Target:
90% of students will successfully defend their presentation to the review panel. The defense will be evaluated relative to each of the 10 stated outcomes separately (bathymetry, water levels, positioning, hydrographic practice, hydrographic data management, environmental science, nautical charting, legal aspects, remote sensing, and project management). For a successful defense, the student must achieve a grade of B or above for each outcome.

Findings (2011-2012) - Target: Partially Met
Ten of thirteen students (76.9%) conducted a successful defense and achieved a B or better in the HYD 610 Hydrographic Field Project. One student made a successful presentation on a 2nd attempt. The students taking the 2012 summer project had been divided into two teams consisting basically of six one-year students on one team and four two-year students and two one-year students on the second team. The 13th student, also a one-year student, supported both teams in a data quality assurance role. The first team completed a successful survey of the NASA Michoud Assembly Facility harbor conducting an ellipsoid referenced survey using the Edgetech 4600 bathymetric side scan sonar. This data set was highly desired by NASA for future planning purposes. All members of this team received an "A" in the course. The second team completed a survey of the Gulfport small craft harbor also using ellipsoid referenced survey methods with the EdgeTech 4600 bathymetric side scan sonar. This team had serious team dissensions which affected the quality of their data. Three of six members of the Gulfport team obtained a B, the rest C+ or B-. The learning outcomes for the Field Project were: a. Comprehensive and detailed knowledge on how to plan, stage, and execute hydrographic survey operations that meet international and national standards. The Michoud Team data collection has some minor problems with bunched SV casts, no bottom samples, and some discrepancies with their survey vessel configuration file. The Gulfport Team, however, had serious problems due to little understanding of tides and vertical referencing and did not have enough SV casts, did not conduct proper project management procedures, and had very poor teamwork. Both teams did not do a TotalStation vessel survey and failed to process data in a timely manner to catch errors that could be corrected before demob. b. Detailed knowledge and ability to process and analyze collected data that meet international and national standards for quality survey data. The Michoud team used wrong geodetic parameters for datum and ellipsoid and incorrectly computed the tidal component of TVU. The Gulfport team did not include SV and vertical datum uncertainties in TVU and had cross checks that did not meet standards which is a major discrepancy. Both teams failed to process data during survey to catch errors and correct before demob. c. Detailed knowledge and ability to produce grid surfaces, paper charts, and ENCs that meet international and national standards. This criteria was met. d. Ability to document all aspects of the field project in the Report of Survey and other documents that meet international and national standards. The Gulfport team submitted a totally incomprehensible tides report.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey

field work procedures particularly ...

Robust equipment and software inventory
Established in Cycle: 2009-2010
Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipme...

M 9:Writing Assignments (SOP document)
Students will demonstrate their ability to work in a group environment by participating in group projects in their courses. Each student will be required to complete a Standard Operating Procedure document for an assigned task and then support the entire class as the SME for that task. Each student will take the leadership role during field data collection and during group exercises.

Source of Evidence: Written assignment(s), usually scored by a rubric

Target:
90% of students will successfully complete the assigned SOP, without instructor assistance, in the Hydrographic Data Management course. A grade of B and above for the SOP document is considered to be sucessful.

Findings (2011-2012) - Target: Met
Thirteen of 13 students successfully completed an exercise in the writing of a SOP in HYD 601. Furthermore, 15 of 15 students successfully completed a Project Management module in HYD 608 that consisted of seven lectures plus active learning exercises.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Revise student learning outcomes
Established in Cycle: 2007-2008
Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly ...

Revise sequence of courses
Established in Cycle: 2010-2011
Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

M 10:Alumni Survey
Alumni will be interviewed within one year of graduation to determine the suitability and currency of presented material. 90% of alumni, questioned within one year of graduation, will feel that their learning was based on up-to-date information, and is relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. This evaluation instrument will be comprised of questions that specifically address all learning outcomes.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:
90% of responding alumni, questioned within 10 years of graduation, will feel that their learning was based on up-to-date information, and was relevant to their career. Evaluation will be based on the Alumni Evaluation Instrument responses. Each question in the instrument will have a 1 to 5 scale response (far below needs to substantially exceeded needs), with an average of 3 (met needs) considered to be a minimum affirmative response.

Findings (2011-2012) - Target: Not Reported This Cycle
Alumni survey not due

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Plan Employer and Alumni Polls Procedure
Established in Cycle: 2005-2006
An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private ...

Details of Action Plans for This Cycle (by Established cycle, then alpha)

Plan Employer and Alumni Polls Procedure

An employer poll and alumni poll was created in Jul 2009 and will be periodically maintained. Future polls will include private sector employers and foreign organizations.

Established in Cycle: 2005-2006
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Alumni Survey | **Outcome/Objective:** BATHYMETRY | HYDROGRAPHIC DATA MANAGEMENT | HYDROGRAPHIC PRACTICE | NAUTICAL CHARTING HYDROGRAPHY | POSITIONING | PROJECT MANAGEMENT AND LEADERSHIP | WATER LEVELS AND FLOW
Measure: Employer Survey | **Outcome/Objective:** BATHYMETRY | HYDROGRAPHIC DATA MANAGEMENT | HYDROGRAPHIC PRACTICE | NAUTICAL CHARTING HYDROGRAPHY | POSITIONING | PROJECT MANAGEMENT AND LEADERSHIP | WATER LEVELS AND FLOW

Implementation Description: AY 2006-2007
Projected Completion Date: 08/30/2015
Responsible Person/Group: M. van Norden

Map the curriculum

faculty will develop a spread sheet to map program course outcomes to the IHO CAT A outcomes.

Established in Cycle: 2007-2008
Implementation Status: Finished
Priority: High
Implementation Description: August 2008
Projected Completion Date: 08/31/2010
Responsible Person/Group: M.van Norden

Regular progress meetings

All faculty will meet at least monthly to ensure outcomes are being met

Established in Cycle: 2007-2008
Implementation Status: In-Progress
Priority: High
Implementation Description: On going
Projected Completion Date: 08/31/2015
Responsible Person/Group: All Faculty

Revise student learning outcomes

Learning outcomes will be revised to align with the IHO subject areas. Emphasize good survey field work procedures particularly for ellipsoid referenced surveying and learning ENC production. Address programming/Matlab issues by possibly developing a series of U-Tube tutorials that specifically address the

programming and Matlab needs.

Established in Cycle: 2007-2008
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Electronic Nautical Chart | **Outcome/Objective:** POSITIONING
Measure: Examinations | **Outcome/Objective:** ENVIRONMENTAL SCIENCE
Measure: Field Project | **Outcome/Objective:** BATHYMETRY | ENVIRONMENTAL SCIENCE | HYDROGRAPHIC DATA MANAGEMENT | HYDROGRAPHIC PRACTICE | LEGAL ASPECTS | NAUTICAL CHARTING HYDROGRAPHY | POSITIONING | PROJECT MANAGEMENT AND LEADERSHIP | REMOTE SENSING | WATER LEVELS AND FLOW
Measure: Practical Exercises (HYD 600, 601, and 604) | **Outcome/Objective:** POSITIONING
Measure: Practical Exercises (HYD 601) | **Outcome/Objective:** HYDROGRAPHIC DATA MANAGEMENT
Measure: Practical Exercises (HYD 603) | **Outcome/Objective:** LEGAL ASPECTS
Measure: Practical Exercises (HYD 606) | **Outcome/Objective:** NAUTICAL CHARTING HYDROGRAPHY
Measure: Practical Exercises (HYD 611) | **Outcome/Objective:** REMOTE SENSING
Measure: Practical Exercises (HYD 612) | **Outcome/Objective:** WATER LEVELS AND FLOW
Measure: Practical Exercises (MAR 668, HYD 601, & HYD 605) | **Outcome/Objective:** BATHYMETRY
Measure: Writing Assignments (HYD 605 and HYD 608) | **Outcome/Objective:** HYDROGRAPHIC PRACTICE
Measure: Writing Assignments (SOP document) | **Outcome/Objective:** PROJECT MANAGEMENT AND LEADERSHIP

Implementation Description: Completed extensive revisions of learning outcomes for HYD 601, HYD 606, HYD 608, HYD 611, and HYD 612 to better meet latest international standards, student learning needs, and time management of course material delivery. Additional "tuning" needed that will be implemented in 2012 - 2013 includes addressing student deficiences with team building skills and continued lack of student understanding in water level datums and ellipsoid referenced surveying.
Projected Completion Date: 07/31/2015
Responsible Person/Group: van norden, Meador, Wells
Additional Resources Requested: Up to date specialized hydrographic software and hardware. Program heavily dependent on equipment loans and software donations. Course fees of $300 per course for seven courses implemented Spring 2012 semester.
Budget Amount Requested: $25,000.00 (recurring)

Syllabi Standardization

To facilitate outcome assessments and IHO/Hydro program cross referencing all program syllabi will be standardized.

Established in Cycle: 2007-2008
Implementation Status: Finished
Priority: High
Implementation Description: August 2008
Projected Completion Date: 08/31/2010
Responsible Person/Group: All Faculty

Collect and analyze student time allocations

Collect and analyze student time statistics spent on each course, course assignments, and other study time to determine whether curriculum objectives are being met or unintended outcomes are in-progress.

Established in Cycle: 2008-2009
Implementation Status: Finished
Priority: High
Implementation Description: Initial implementation begun in 08/2009

Projected Completion Date: 12/31/2009
Responsible Person/Group: all students and M.van Norden

Conduct survey of employers

Identify employers then implement new survey of employers during June2010.

Established in Cycle: 2009-2010
Implementation Status: Terminated
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Employer Survey | **Outcome/Objective:** BATHYMETRY | HYDROGRAPHIC DATA MANAGEMENT | HYDROGRAPHIC PRACTICE | NAUTICAL CHARTING HYDROGRAPHY | POSITIONING | PROJECT MANAGEMENT AND LEADERSHIP | WATER LEVELS AND FLOW

Implementation Description: Subscribe to Survey monkey
Projected Completion Date: 08/30/2011
Responsible Person/Group: Maxim van Norden

Robust equipment and software inventory

Negotiate equipment and software support with federal and industry partners to ensure availability of sufficient working equipment and software licenses.

Established in Cycle: 2009-2010
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Electronic Nautical Chart | **Outcome/Objective:** POSITIONING
Measure: Field Project | **Outcome/Objective:** BATHYMETRY | ENVIRONMENTAL SCIENCE | HYDROGRAPHIC DATA MANAGEMENT | HYDROGRAPHIC PRACTICE | LEGAL ASPECTS | NAUTICAL CHARTING HYDROGRAPHY | POSITIONING | PROJECT MANAGEMENT AND LEADERSHIP | REMOTE SENSING | WATER LEVELS AND FLOW
Measure: Practical Exercises (HYD 600, 601, and 604) | **Outcome/Objective:** POSITIONING
Measure: Practical Exercises (HYD 601) | **Outcome/Objective:** HYDROGRAPHIC DATA MANAGEMENT
Measure: Practical Exercises (HYD 603) | **Outcome/Objective:** LEGAL ASPECTS
Measure: Practical Exercises (HYD 606) | **Outcome/Objective:** NAUTICAL CHARTING HYDROGRAPHY
Measure: Practical Exercises (HYD 611) | **Outcome/Objective:** REMOTE SENSING
Measure: Practical Exercises (HYD 612) | **Outcome/Objective:** WATER LEVELS AND FLOW
Measure: Practical Exercises (MAR 668, HYD 601, & HYD 605) | **Outcome/Objective:** BATHYMETRY

Implementation Description: New survey equipment (e.g., Reson multibeam, POS-MV, Topcon GPS, and EdgeTech Bathymetric side scan) obtained in 2011 by the Hydrographic Science Research Center has been vital in the teaching of advanced survey methods.
Projected Completion Date: 12/30/2015
Responsible Person/Group: M. van Norden

Revise sequence of courses

Revise sequence of courses, re-assign instructors, and make adjustments to syllabus and credit levels.

Established in Cycle: 2010-2011
Implementation Status: Finished
Priority: High

Relationships (Measure | Outcome/Objective):

Measure: Electronic Nautical Chart | **Outcome/Objective:** POSITIONING
Measure: Practical Exercises (HYD 600, 601, and 604) | **Outcome/Objective:** POSITIONING
Measure: Practical Exercises (HYD 601) | **Outcome/Objective:** HYDROGRAPHIC DATA MANAGEMENT
Measure: Practical Exercises (HYD 603) | **Outcome/Objective:** LEGAL ASPECTS
Measure: Practical Exercises (HYD 606) | **Outcome/Objective:** NAUTICAL CHARTING HYDROGRAPHY
Measure: Practical Exercises (HYD 611) | **Outcome/Objective:** REMOTE SENSING
Measure: Practical Exercises (HYD 612) | **Outcome/Objective:** WATER LEVELS AND FLOW
Measure: Practical Exercises (MAR 668, HYD 601, & HYD 605) | **Outcome/Objective:** BATHYMETRY
Measure: Writing Assignments (HYD 605 and HYD 608) | **Outcome/Objective:** HYDROGRAPHIC PRACTICE
Measure: Writing Assignments (SOP document) | **Outcome/Objective:** PROJECT MANAGEMENT AND LEADERSHIP

Implementation Description: 1. Changes to Fall program: Moved HYD 608 from Summer to Fall; Moved HYD 602 from Spring to Fall; Changed instructors for MAR 668 and HYD 620; Changed day/time for HYD 609 and HYD 620. 2. Planned Spring Semester changes: Change instructors for HYD 611 and HYD 601; Change HYD 612 from 2 credits to 3 credits and times to MW, 1:00 - 2:15; Move HYD 602 to the Fall. 3. PlannSummer term changes: Move HYD 606 from Fall to Summer, change from 3 crs to 2 crs, change instructors; Move HYD 608 to Fall,
Projected Completion Date: 07/30/2012
Responsible Person/Group: M. van Norden, Dave Wells, Stephan Howden

Analysis Questions and Analysis Answers

What specifically did your assessments show regarding proven strengths or progress you made on outcomes/objectives?

1. Our assessments showed that we have many proven strengths and have made substantial progress on objectives. On June 1, 2011, the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers re-certified the USM Hydrographic Science Master's Degree Program at the Category A (highest) level. We continue to be one of only two academic institutions in North America providing an internationally recognized program in Hydrographic Science. Revisions were made to the curriculum to better address the new standards published in "Standards of Competence for Hydrographic Surveyors, 11th ed." and to address student and alumni feedback. A significant strength of our program is its agility to adjust to new survey technology, student learning needs, and professional competency standards.

Hydrographic Science Program strengths are listed below:

a. strong support from university management (President, Provost, and Dean);
b. strong support by the U.S. Navy with a renewal of the Memorandum of Agreement in April 2011, the loan of survey equipment, and four student candidates in AY 2011-2012 in the program;
c. strong support by industry partners that provide the latest software and hardware at highly reduced or gratis cost amounting to at least $500,000 in savings and are indicating support for sponsoring internships;
d. one of only two institutions in North America offering a degree in Hydrographic Science;
e. a well-qualified teaching faculty with international reputations;
f. capital improvements made by the Hydrographic Science Research Center; with the acquisition of $400,000 in state-of-the-art survey technology that will support student practical exercises and summer project surveys;
g. an excellent equipment suite of student laptop computers and boats, as well as, sonars, GPS equipment, and other instruments available through the Hydrographic Science Research Center and the Navy Fleet Survey team;
h. high entrance and graduation standards;
i. very demanding student summer survey projects which are very representative of hydrographic survey projects conducted by U.S. government organizations and commercial survey companies;
j. a location conducive to synergistic partnerships with Navy, NOAA, USACE, and others;
k. increasing interest by non-Government students in attending a program with a 100% employment rate of graduates into high-paying jobs.

What specifically did your assessments show regarding any outcomes/objectives that will require continued attention?

1. The faculty had already concluded in the AY 2008 - 2009 assessment that the student learning outcomes of the then current curriculum did not reflect all the expected outcomes required by the FIG/IHO/ICA International Board. In addition, surveys of alumni and of employers indicated some dissatisfaction with the curriculum and execution of program courses. Corrective actions (discussed in paragraph 3) were initiated in AY 2009 - 2010 and continued through AY 2011 - 2012. These will require continued monitoring and assessment in forthcoming years to gauge effectiveness.

2. Surveys of employers and alumni are also being conducted on a biennial basis. The summary result of the 2011 employer survey was 3.6. Likewise the summary result of the 2011 alumni survey of students who graduated in 2005 - 2010 was 3.0. For both surveys the range was 1 to 5 with 1 meaning Significantly Below Peers and 5 meaning Significantly Above Peers. (3: Same as Peers, 4: Above Peers). Acknowledging that there is always a human motivational factor that prevents these responses to ever reach the 5 level, efforts will continue to address employer and alumni criticism of the program so that employers and students realize their expensive investment in labor and dollar expenditures.

Specific concerns expressed by alumni and employers in surveys conducted in 2009 and 2011 included:

a. the 1st semester of the program was too theoretical and should include practical on-the-water exercises to stimulate student interest;
b. graduates lacked in-depth knowledge of tidal datums and models;
c. incoming students with no prior knowledge in MATLAB programming were severely disadvantaged;
d. incoming students with no prior hydrographic experience had trouble understanding the basic concepts behind the practical exercises;
e. graduates lacked in-depth knowledge and skills in producing hydrographic products and deliverables required by employers and their customers;
f. graduates lacked project management skills;
g. faculty lacked experience on the latest equipment and software;
h. the Remote Sensing course was focused on ocean processes and not on the required learning in shoreline delineation; i. and faculty needed to better understand student concerns.

3. Starting in AY 2009 - 2010 the faculty began revising the curriculum to address the new standards published by the International Board for re-certification. In addition, other corrective actions to address the above alumni and employer concerns were implemented. These revisions and actions will require continued monitoring for assessing their effectiveness. We strongly believe that the corrective actions discussed below will greatly improve the effectiveness of this program.

The following specific actions were completed or are currently in-progress:

AY 2009 - 2010

a. strengthened learning objectives in Nautical Science (HYD 609) and moved it from the Summer term (3rd semester of the curriculum) to the Fall semester to enable on-the-water practical exercises during the 1st semester of the program;
b. increased on-the-water practical exercises in Data Management (HYD 601) within budgetary limits;
c. temporarily increased tide and water level instruction by adding a learning module to Practical Hydrography (HYD 608);

AY 2010 - 2011

d. implemented pre-semester short refresher sessions on calculus and linear algebra (3 days), and Matlab programming (3 days);

AY 2011 - 2012

e. moved Practical Hydrography (HYD 608) from the Summer term to the Fall semester to introduce basic concepts in the 1st semester of the program;
f. added a module on project planning and deleted the tide learning module to the syllabus for Practical Hydrography (HYD 608);
g. included the more in-depth instruction on datums and models in Tides and Water Levels (HYD 612), taught in the Spring Semester, and increased the credit hours from 2 to 3;

h. moved Nautical Cartography (HYD 606) from the Fall semester to the Summer term to provide more timely and responsive instruction to support the student summer project and requirements for nautical charts and other deliverables;
i. kept the curriculum within the prescribed 36 credit hour limit by decreasing the credit hours from 3 to 2 for Nautical Cartography (HYD 606);
j. added a non-tenured faculty member with experience on the latest hardware and software; k. implemented a revision to the syllabus for Remote Sensing (HYD 611), Spring Semester, to better align with the recent learning objectives established by the International Board in the 11th edition and included a field exercise on shoreline delineation;
k. and added weekly meetings with the student class to discuss student concerns, administrative requirements, hydrographic professional qualifications and societies, international/national hydrographic organizations, and survey companies and employers. We are also continuously assessing the performance of our program with the one-minute assessment forms provided to each student at the end of each lecture or exercise;

PLANNED or UNDERWAY:
AY 2012 - 2013

l. move the Project Planning module from Practical Hydrography (HYD 608) to Hydrographic Sessions in the Spring semester and focus more on team building;
m. implement greater utilization of textbooks to provide more background information for students and fill-in knowledge gaps;
n. implement improvements for MATLAB programming instruction within the Program's time constraints;
o. and add a tenured faculty member with experience on the latest hardware and software.

4. Expansion of the academic program will require more qualified students from non-government sources. Current class size varies from 11 to 15 graduate students per course. Extensive discussions with industry leaders indicated a lack of interest in sponsoring employees to our program due to costs and particularly the loss of employee labor to the sponsoring company. This situation is well known and others such as the University of Plymouth (UK) have started an online degree program in Hydrographic Science. At this time, although Blackboard is available, we do not have the resources to develop online courses that are comparable to current in-class lectures and on-the-water exercises. Another problem with expansion is a lack of research grant funds has adversely affected the number of applicants, particularly non-government students seeking financial support. Also there appears to be a "dumbing down" of academic requirements in mathematics and computer programming for graduation among undergraduate programs in the USA. Consequently, more applicants are being rejected. These three concerns will require continued attention to find innovative solutions for increasing student class sizes.

5. Continued growth will depend on more allocation of academic resources or obtaining grants from private industry donors. The Hydrographic Science program presently is assigned one tenured professor, one full-time instructor, one contract professor, one non-tenured research professor, and several adjunct faculty. Available funds to support the academic program has been inadequate to support equipment maintenance or replacement, to attend professional conferences to learn new innovative techniques, to support students in need of tuition relief, and to promote the program and increase the number of students. Furthermore the lack of research funding prevents the admission of students seeking grant support. The lack of research grants can be attributed to the small number of faculty seeking these grants. Therefore, efforts to obtain additional funding and hardware/software resources from government organizations and private industry is a high priority and require continued attention.

6. The noisy classroom in Building 1210 is not conducive to learning. The large indoor A/C units adjacent to the classroom permeate noise levels probably in excess of Federal standards. The location of Building 1210 promotes isolationism and non-participation in DMS functions by the Hydro students.

Annual Report Section Responses

Program Summary

1. The Hydrographic Science Program began in August 1999 as a partnership between the U.S. Navy and USM to establish a Masters Degree program in Hydrographic Science that met the Navy's needs for well-trained hydrographers. The Navy had recognized that there were limited opportunities for Navy military and civilian personnel to acquire the appropriate level of knowledge and competency in hydrography and bathymetry needed to support national security objectives. Furthermore, the development of offshore hydrocarbon exploration in the Gulf of Mexico coastal and offshore waters has also created an increased demand for qualified hydrographers trained in state-of-the-art methods and techniques. The Program is designed to provide a graduate-level education for students from Mississippi, the Gulf of Mexico coastal region, the nation as a whole, and the international hydrographic community.

2. The Program is designed to meet the very rigorous and detailed standards set by an International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) with members from the Federation Internationale des Geometres (FIG), International Hydrographic Organization (IHO), and International Cartographic Association (ICA). The current standards are published in the 83-page document, "Standards of Competence for Hydrographic Surveyors, 11th edition, 2010." On May 4, 2011, the International Board came to Stennis Space Center to assess all aspects of the Program to include: funding resources and institutional support, faculty credentials, detailed course syllabi, equipment for practical exercises, entrance and graduation standards, facilities, research projects, and much more. On June 1, 2011, The USM Hydrographic Science Masters Degree Program was awarded a re-certification at the Category A level.

3. For the U.S. Government, the immediate impact of the USM Hydrographic Science Program has been the formation of a cadre of technically accomplished scientists and leaders available to the Naval Oceanographic Office (NAVOCEANO) and its Fleet Survey Team (FST), the Navy Research Laboratory, NOAA's Office of Coast Survey, the National Geospatial-intelligence Agency, and the U.S. Army Corps of Engineers. The current (2012) Director, NAVOCEANO Hydrographic Department; the Commanding Officer, Fleet Survey Team; and the Director, Joint Airborne Lidar Bathymetry Technical Center of Excellence are all alumni of this program. Other alumni are employed in private industry including Fugro, David Evans and Associates, EGS, Teledyne Odom, and CARIS. Navy and NOAA scientists have deployed around the world, conducting operations critical to national security, national and international seaborne commerce, and disaster response. Our alumni have also implemented the use of innovative technologies greatly enhancing the effectiveness and efficiency of hydrographic operations. They are at the forefront of employing airborne bathymetric lidar for nearshore bathymetric measurements, using buoys equipped with precision GPS receivers to measure tides in lieu of shore-based tide gauges, and collecting data relative to the ellipsoid rather than traditional tidal datums.

4. Mr. van Norden obtained national recognition for the Hydrographic Science Program by being interviewed on NPR Science Friday by Ira Flatow on 20 Jan 2012 for a discussion on Electronic Chart Display and Information Systems and the Costa Concordia disaster. Furthermore the program was spotlighted on local television station WLOX also in conjunction with the Costa Concordia disaster. RADM (ret) Ken Barbor and several students were interviewed concerning their thoughts on the causes of the disaster.

5. On July 30, 2012, 12 students completed the Hydrographic Science Program and were recognized in a ceremony at Stennis Space Center where Dr. Frances Lucas, Vice President/Campus Executive Officer for the University of Southern Mississippi Gulf Coast gave the keynote address. Our program has graduated 132 Masters Degree students over the past twelve years and two students have completed the Ph.D. program in Marine Science with an emphasis in Hydrographic Science. At its inception, student enrollment in the program came solely from the Navy, both military and civilian. Since that time the program had progressed to having a diverse mixture of both sponsored and unsponsored students. A growing number of students come on their own due to the high demand for graduates in this well-paying field. Sponsored and unsponsored students have also come from eighteen different nations. The graduating 2011 - 2012 class had twelve students of which six were sponsored by U.S. Government agencies, two were sent by foreign hydrographic services, and four were unsponsored students including one international student. In addition, three students are currently enrolled in the Marine Science Ph.D. program with an emphasis in Hydrographic Science.

6. The Program summer capstone field project is the culmination of this intense curriculum in all facets of hydrography in which the students must demonstrate learned capabilities to a Comprehensive Exam examiner panel. We conducted two simultaneous survey projects in two completely different areas. The class of 2011 -

2012 completed hydrographic surveys of the NASA Michoud Assembly Facility harbor and the Gulfport MS Small Craft Harbor. The student survey teams collected valuable high-quality deliverables to include: high-resolution bathymetric surfaces from multibeam sonar data, side-scan sonar mosaics of of the bottoms, side-scan snippets of underwater navigation hazards, reports to the Coast Guard of newly discovered hazards to navigation, updates to the Coast Pilot, an S-57 data set, new or updated paper navigation charts, Electronic Navigational Charts, and detailed comprehensive Reports of Survey. Both student survey teams used an EdgeTech 4600 interferometric bathymetric side scan sonar in an ellipsoid referenced survey. This is the state-of-the art in hydrographic survey operations. The processed data and selected chart products will be forwarded to NASA, local communities and NOAA for their use. The Comprehensive Exam examiner panel included not only USM Hydrographic Science faculty but also representatives from the Navy who were very impressed with the knowledge and skills of the students and their achievements in the summer projects.

7. Rapid technological changes in hydrography and the desire to remain one of the premier hydrographic institutions require expensive hardware and software. New equipment was made available to the academic program via the Hydrographic Science Research Center through their CZMIL grants and donations by their industry partners, such as, C&C Technologies: Applanix POS MV inertial measurement unit, Topcon RTK GPS base station and rovers, Edgetech 4600 swath bathymetry side scan sonar, Reson 7125 multi-beam echo sonar, Knudsen 3.5kHz sub-bottom profiling single beam sonar, and C-NAV SF5050 GPS receiver.

8. Funds are needed each year to replace or repair broken components, pay for software maintenance, replace consumables, replace computers every four years, fund boat operating costs, pay annual certification fees, and fund travel to hydrographic conferences.

Actions to address funding issues included:

a. renewed a Memorandum of Agreement with NAVMETOCCOM which was signed by President Saunders and RDML Jonathan White on April, 4, 2011;
b. continued academic partnerships with software and hardware vendors to obtain low cost or free software and donations of new equipment - these partnerships are worth about $500, 000 in savings;
c. and tripled course fees (about $21,000 annually) to substantially cover the true technology costs of this program.

9. Grants, research papers, presentations, and services: A. During the Academic year of August 2011 to August 2012, The Hydrographic Science Research Center (HSRC) was in the execution phase of four research grants. Three of the grants, totaling $1,122,659, were in support of the Coastal Zone Mapping and Imaging Lidar (CZMIL) program. CZMIL is the next generation Airborne Lidar Bathymetry system sponsored by the U.S. Army Corps of Engineers in support of their National Coastal Mapping Program. During this period, HSRC was establishing ground truth topography, bathymetry, and water column Inherent Optical Properties in order to assess and validate the accuracies of CZMIL #1 prior to release to the USACE as an operational system. Involved in the project were six research staff and six graduate student research assistants, including Drs. Cottin and Dodd who presented interim reports on the validation efforts to a June 2012 Joint Airborne Lidar Bathymetry Technical Center of Expertise Workshop.
Other HSRC projects were:

A. Dr. Dodd provided algorithm development for C&C Technologies associated with the inclusion of a tide measuring capability into C-Nav precision navigation service. This collaboration included a $5,500 grant and C-Nav equipment and subscription services. The HSRC, in collaboration with the side scan sonar manufacturer, EdgeTech, conducted several at sea comparison trials of the EdgeTech 4600 Swath Bathymerty Side Scan Sonar and the Reson 7125 Mutibeam Echo Sounder. EdgeTech provided $1,500 for vessel operation costs and upgrades to the 4600 software and hardware.
B. Rear Admiral (ret) Ken Barbor was appointed a member of the NOAA Hydrographic Services Review Panel in May 2012 by NOAA Administrator Jane Lubchenco, Ph.D. The Panel is a federal advisory committee comprised of maritime officials and industry executives that provide independent counsel and strategic recommendations to NOAA on improving ocean and coastal navigation products, information, data and services.
C. Dr. David Wells as a member of the University of New Brunswick"s Ocean Mapping Group provided the 6-day Multibeam Sonar Training course in Freemantle, Australia (Nov 2011); New Orleans, LA (Jan 2012); and Brest, France (Mar 2012).

D. Dr. David Dodd presented papers for: FIG 2012 (with Jerry Mills): "Ellipsoidally Referenced Surveys and Separation Models;" JALBTCX Workshop 2012: "Preliminary CZMIL Bathymetry Results;" and Mississippi Association of Professional Surveyors: "Mississippi Real Time Network." He served on FIG Commission 4, WG 4.1 ERS as technical Lead; Mississippi Real Time Network advisory committee as technical lead; Memorial University of Newfoundland Advisory Committee for new Ocean Mapping program; and generated and marked exams for the hydrographic module of the Canadian Board of Examiners for Professional Surveyor. He completed the Cat Island and Fort Lauderdale CZMIL validation surveys and completed research and a report for C&C Technologies (C-NAV), "Real-Time Tides using C-NAV RTG and Mean Sea Surface models."

E. Mr. van Norden received a $1000 grant for Gulf Coast Staff Development Grant on Dec 14, 2011 which was used to interview executives at hydrographic survey and equipment companies concerning employee education. He presented, "Hydrographic Science Education Opportunities at the University of Southern Mississippi (USM)", USACE Community of Practice 2011, New Orleans, 19 October 2011 and a presentation and paper, "Crowdsourcing for Hydrographic Data: A Preliminary Examination of Collected Data and Recommendations for its Effective Utilization, CARIS 2012, Vancouver, BC, 27 Jun 2012. He was interviewed by NPR Science Friday, with Ira Flatow, 20 Jan 2012, discussing ECDIS and the Costa Concordia disaster. He serves on the American Congress of Surveying and Mapping (ACSM) /THSOA Hydrographer Certification Board. F. Ms. Kandice Gunning, a Hydrographic Science graduate student, under the supervision of Dr. David Wells, is assisting the IHO Data Quality Working Group (DQWG) in the design and realization of a S101 ENC data quality model. The model is intended to intuitively convey to the mariner the quality of the charted data but still maintain the technical standards set by S-57. The USM approach is to develop a test bed for visualizing standard quality attributes and new innovations which will be used to solicit input from the maritime community.

Continuous Improvement Initiatives

One-Year Plan

1. Continue fine tuning of hydrographic courses and program structure as necessary. 2. Find better academic facilities for the Hydro Program. 3. Conduct a campaign to obtain support from the private sector for equipment gifts, research grants, students sponsorships, and endowment of faculty positions. Received $1000 award from Gulf Coast to enable travel. Preliminary plan is to make two trips to two locations with hydrographic company groupings and make a pitch for sponsoring students and/or endowing a professor to conduct research. 4. Initiate efforts to gauge support for a Category B program at the undergraduate level. There is a huge demand in private industry for qualified hydrographers. In addition to the needs of Government organizations, commercial survey companies must have certified hydrographers sign-off on hydrographic survey contracts. Offshore hydrocarbon exploration in the Gulf of Mexico and other offshore areas around the world and maintenance of the nation's infrastructure of waterways have created this increased demand for qualified hydrographers trained in state-of-the-art methods and techniques. Currently the commercial side of this industry is heavily represented by personnel receiving their hydrographic training from outside the United States. Our goal is that this educational demand for hydrographers be met by Southern Miss. 5. Initiate efforts for on-line instruction to meet the needs of industry which has very time-constrained availability windows.

Five-Year Plan 1. Continue to tune the curriculum to the latest international competency standards and the needs of hydrographic employers.

2. Increase the hydrographic faculty to meet the teaching loads of both graduate and undergraduate programs, to enable a robust research program, and to implement on-line instruction in selected courses. 3. Execute a robust research program in hydrography using commercial and government grants. 4. Implement robust on-line programs and a Category B level undergraduate program in hydrography.

Closing the Loop

See Analysis