

ME 495- Directed Research / BSc Research Thesis

2015-2016

Catalog Data	ME495 Directed Research / BSc Research Thesis (3-0-3) A well monitored and structured BSC Thesis/Directed Research Course for Active Research Projects-which could be taken only as a onetime Elective Special Topic. <u>It is only open to students having a GPA of 3 or above and consent of instructor is mandatory.</u> Faculty conducting the course must submit a formal well written program of research work and deliverables and grading policy in semester prior to enrollment for approval from department. Students can start working on the topics a head of time prior to formal enrollment as a course after its approval.
Textbook	None.
References	Tubular Exchanger Manufacturers Association. <i>Standards of Tubular Exchanger Manufacturers Association</i>. Tema, ninth edition 2007. Boiler, A. S. M. E., and Pressure Vessel Code. "Sec." VIII, Div 1 (2010).
Instructor	Dr. Fadi Al-Badour
Goals	This course is intended to give the student the basic tools to know how to conduct industrial survey, literature review, patent search, and utilizing industrial standards and codes. Learn the different tube-tubesheet joining and welding methods, solid-state welding i.e. friction diffusion bonding, and weld integrity. Know the process of product design, development and systems integration to achieve an intended function of the new tool. Utilize pre gained skills in design, manufacturing, material characterization, engineering computational programing and design of experiment in developing and testing the new tool.
Outcomes	Specific Outcome of this Research Course The student is expected to learn about how to: 1. Define the controlling process parameters and identify a window of optimum ones, according to industrial and literature surveys.

2. **Design** of Friction, friction diffusion, and friction stir diffusion welding tools for tube-tubesheet seal and strength welding.
3. **Perform** tube roller expansion on tubesheet using standard procedures.
4. **Perform** tube-tubesheet seal welding using Friction and friction diffusion welding techniques.
5. **Design, Develop, and Test** new tool to perform simultaneous tube expansion and friction welding.
6. **Evaluate** produced tube-tubesheet joints quality
7. **Analyze** collected data during joining process and material characterization of welded joints to **determine** the effect of welding parameters on joint integrity.

General ME495 Outcomes

- (a) **Imparting Research Skills and Tools**-Course must impart necessary research skills, tools and methodology ,and computational and or experimental skills to prepare and orient the student in doing independent or team oriented research work in his career or and for his graduate studies.
- (b) **Imparting Skills to Professionally Document the Research Findings** -The student must be prepared to document his research finding ultimately in form of a formal research paper.

Research work

The research work focuses on design and development of a new tool that can be used for simultaneous tube-roller expansion and friction welding on a tubesheet. The tool will be designed for shell and tube heat exchangers with $\frac{3}{4}$ inch aluminum and copper-nickel tube on Aluminum and steel tubesheet. To achieve this goal, welding using proposed techniques (Friction, friction diffusion welding) will be performed separately to find a range of successful process window, understand the developed loads and temperatures on the tool. Accordingly, the new tool will be designed in a way it will be capable of sustaining such working conditions.

Evaluation

The student will meet with the course Instructor on a weekly basis and submit two progress reports and one final report to the Instructor. The final report will be prepared in form of formal research paper ready for submission. He will also make a presentation at the end of the semester.

The final report and the presentation will be evaluated by the; instructor and a panel of Mechanical Engineering faculty members. The panel of faculty including the course instructor) will evaluate the report and the presentation. The proposed panel will consist of the following ME faculty members:

Prof. Nesar Merah

Dr. Abdelaziz Bazoune

Grading

Weekly meetings	30%
Progress Reports	30% (15% each)
Final Report	(in Research Paper Form Ready for Submission)
	25% (15 % by Instructor and 10 % by panel)
Oral presentation	15% (panel)

August 26, 2016.

Chairman, Mechanical Engineering

Subject: Proposal for ME495 Directed Research / BSc Research Thesis.

Attached you will find a proposal to offer ME495 during next semester (161) for Mr. Abdullellah Yousef Hbbani (ID# 201264320), who maintains a GPA of 3.8. The student is interested in taking ME495 with me on a research topic involving design and manufacturing. Therefore, I have developed a proposal involving design and development of a new tool that could be used to perform simultaneous tube-roller expansion and friction welding on tubesheet. In addition to ME 495, he will be taking two technical elective; ME489 Finite element Analysis in Mechanical Design, ME 451 Design and analysis of engineering experiment that will be supporting his independent research in ME 495.

Abdullellah fulfills all the requirements of ME495. I, therefore, seeking your approval for the proposed course and allow him to register in this course.

Thank You,

Dr. Fadi Al-Badour

Assistant Professor

Mechanical Engineering.