Course #	MET x351	ETM x351

Title *Measurement and Analysis*

Description *Introduces students to mechanical measurements, instrumentation and experiment data. The principles developed in class are applied in the laboratory and technical report writing is required. Team based Laboratory experiments utilize statistical techniques in mechanical measurements of temperature pressure, force, deformation, strain, and rotational frequency.*

Outcomes	***a***	***b***	***c***	***d***	***e***	***f***	***g***	***h***	***i***	***j***	***k***
1. To be able to define and distinguish the differences between accuracy, uncertainty and precision as they apply to measurement instruments and analysis of test data,	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐
2. To be able to determine the net or total uncertainty in the measurement of a system parameter based on the uncertainty of the individual instruments used to measure the independent parameters that constitute the experiment,	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐
3. To be able to understand and use the statistics of the normal distribution in the solution of the probability of the certainty of the results of an experiment,	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐
4. To be able to properly construct an experiment with clearly determined objectives and a means of determining the significance of the results via established statistical analysis tools,	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐
5. To be able to use dimensional analysis to properly determine the significant parameters and dimensionless groups in order to perform an effective experiment,	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐
6. To be able to understand and have a working, applications-oriented knowledge of the following common engineering instruments: thermocouple and thermometer, barometer and manometer, pressure gauge (absolute and gage pressure units), pressure and temperature transducers, strain gage, Wheatstone (electric circuit) bridge, mass measurement scales, rotational speed measurement systems using oscilloscope,	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐
7. To be able to understand and determine the following statistical parameters of a set of experimentally determined data: standard deviation, variance, average, and confidence level,	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐
8. To be able to analyze the results of an experiment by applying the following statistical relationships either manually using the textbook tables and graphs or via spreadsheet (or other computational software): Student-t test, Chi-square test, Cheveneaut's Theorem, cumulative probability (i.e. the S-curve), Least Squares Fit and Regression Coef.,	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐
9. To be able to solve 'real-world' engineering applications using all of the above after determining which equations apply and present Laboratory Reports on several topics that demonstrate the proper application for inclusion in the student's portfolio of course work.	☑	☑	☑	☐	☑	☑	☐	☑	☐	☐	☑