Modeling and Problem Solving with Spreadsheets and Databases for Engineers

CSE 2112

Credit Hours:
3.00

Course Coordinator:

Course Length:
14 weeks (autumn or spring)
12 weeks (summer only)

Representative Textbooks and Other Course Materials:

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Textbooks and Other Course Materials Entered.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Course Description:
Spreadsheet and database modeling/programming concepts and techniques to solve business and engineering related problems; efficient/effective data handling, computational analysis and decision support.

Prerequisites and Co-requisites:
Prereq: 1222, 1223, 1224, Engr 1281.01H, or 1281.02H. Prereq or concur: Math 1151, 1161.01, or 1161.02.

Designation:
Elective
**Course Goals / Objectives:**
Be competent with programming spreadsheets by appropriately using simple and nested functions, including logical and numerical functions, basic statistical functions, time and date functions, and table lookup functions.
Be competent with designing/engineering spreadsheets to minimize errors in construction and modification, including appropriately using relative/absolute cell referencing.
Be competent with aggregating and summarizing multivariate data sets, including both numerical and categorical variables.
Be competent with importing into spreadsheets from large data sets in text format and with more than one data source.
Be competent with applying sound spreadsheet engineering principles in business contexts such as pro forma income and balance sheets, basic analysis of large data sets, and fundamental computations for financial, marketing, and operational analysis.
Be competent with using spreadsheets to effectively communicate their purpose and process, both on the computer and on paper.
Be competent with using spreadsheets to effectively communicate results using appropriate numerical and graphical tools.
Be familiar with concepts of relational databases.
Be familiar with using MS Access to create data tables, simple reports, and forms.
Be competent with solving problems using Access Query tools including selection queries, sorts, aggregation, calculations, inner/outer joins, and situations with datasets containing many-to-many relationships using multiple queries.
Be exposed to tools that facilitate lifelong learning of technology.

General Education overall goal statement: Students develop skills in quantitative literacy and logical reasoning including ability to identify valid arguments, use mathematical models, draw conclusions and critically evaluate results based on data.

General Education goal statement for Basic Computational Skills: Students demonstrate computational skills and familiarity with algebra and geometry, and apply these skills to practical problems.

General Education goal statement for Mathematical and Logical Analysis: Students comprehend mathematical concepts and methods to construct valid arguments, understand inductive and deductive reasoning, and increase general problem solving skills.

General Education goal statement for Data Analysis: Students understand basic concepts of statistics and probability, comprehend methods needed to analyze and critically evaluate statistical arguments, and recognize importance of statistical ideas.

**ABET-EAC Criterion 3 Outcomes:**

<table>
<thead>
<tr>
<th>Some contribution (1-2 hours)</th>
<th>1</th>
<th>an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some contribution (1-2 hours)</td>
<td>6</td>
<td>an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions</td>
</tr>
</tbody>
</table>
### Course Topics:

- Spreadsheet Design, IF and Boolean Functions, Scenario Manager and Goal Seek
- More Boolean function options, calculations and reference functions.
- Excel Solver, Pivot tables, graphing
- Excel Statistical functions, Date functions, Text Functions and Data validation techniques
- Programming in Excel VBA
- Introduction to Database Design
- Writing Queries in Access - select queries, sorting, aggregating, writing expressions, using inner and outer joins.
- Summarizing Data - using data with many-to-many relationships and advanced querying techniques.
- Access Forms and Reports, Macros, and Programming in Access
- Using Excel as a Database - importing data, Excel data tables, filtering, sorting, subtotals, pivot tables; using text functions to manipulate data; advanced Excel tools: scenario manager, data analysis tools, and macros.