

9/3/2013

## **Course Descriptions: Undergraduate/Graduate Certificate Program in Data Visualization and Analysis**

Seton Hall University, South Orange, New Jersey  
<http://www.shu.edu/go/dava>

### **Visualization and Cognition**

#### **DAVA 3000/7000 Data Visualization, 3 credits**

Visualization is crucial for understanding complex information and for enabling humans to act on information appropriately. For example, visualization is used in many application areas such as social and health sciences, business, the natural sciences and engineering. This course introduces the foundations of information visualization rooted in cognitive psychology and perception. This course also teaches importing information from data sources, such as data bases and the internet, preparing data for processing, as well as creating and presenting visualizations using standard software. The data visualization course uses the visualization software Tableau and MS Excel. Tableau will be provided for free. The textbooks are Show me the Numbers and Now You See It by Stephen Few.

#### **PSYC 3124/7124 Cognition for Visualization, 3 credits**

Visualization students will be challenged to apply the basic research findings of cognitive psychology to the problem of the visual representation of data. Basic knowledge about how our perception, attention, and memory work, as well as how we reason and make decisions, has implications for how we should summarize and present data to facilitate understanding and discovery. The operations of the mind, which are the topic matter of cognitive psychology, are so ubiquitous that they are difficult to address and even notice. A common experience of students of cognitive psychology is that by questioning and reflecting upon simple everyday activities, much of your ordinary mental life begins to seem quite extra-ordinary. For instance, reading this sentence involves perception, attention, language comprehension, and, hopefully, some kind of critical reflection on its contents. You will soon be in a position to appreciate that the feats accomplished by your mind on a normal basis are both more marvelous and more mysterious than any current computer animation or the most sophisticated special effects in movies. It is testament to your mind's success that its surprisingly complex operations are typically unconscious and thus remain unnoticed. In order to query its mechanisms we will thus have to adopt a specific mode of investigative curiosity that combines intuitions, speculative hypotheses, and empirical evidence (gained by several methodological approaches) in order to develop, refine and test scientific theories. This course examines research on human and some animal cognitive processes, including perception, attention, memory, concept formation, reasoning, decision-making, and problem-solving. The course will give you an overview of past and current research and theory in cognitive psychology, a basic understanding of the empirical

methods used, and an understanding of the ways in which knowledge of these processes has been applied to real-world problems and to improve the quality of life.

## **Prerequisite in Psychology**

This prerequisite is for the Cognition course PSYC 3214. Most introductory courses in psychology may serve as a substitute. It can be waived for the online certificate program.

### **PSYC 1101 Introduction to Psychology, 3 credits**

Survey of the major content areas of psychology, including physiological, perception, motivation, learning, cognition, personality, developmental, abnormal and social. 3 credits

## **Data Analysis**

### **DAVA 3010/6010 Data Mining, 3 credits**

This course introduces the foundations of applied data mining. There is a need for extracting useful information from raw data in fields such as social and health sciences, business, the natural sciences and engineering. This course covers the fundamental ideas and algorithms of data mining. Furthermore, it teaches applying data mining techniques in order to extract useful information from data. Standard software for data mining will be used. The course is intended for any student desiring an introduction to data mining. The data mining course teaches basics of data organization, using databases including SQL queries, and principles of data mining such as classification, association rules, clustering, text mining. The text books are Data Mining by Witten/Frank/Hall and Sams Teach Yourself SQL in 10 Minutes by Forta. Software used are the data mining software Weka, MS Excel and MS Access. Weka is freely available.

## **Statistics**

### **Undergraduate MATH 1203 Statistical Models for the Social Sciences, 3 credits**

Applications of statistics in the social sciences. Analysis and interpretation of statistical models. Sampling techniques, common flaws and errors in sampling and in using statistics. Descriptive statistics, levels of measurement, measures of central tendency and dispersion. Contingency tables and measures of association for categorical variables. Correlation and linear regression. Probability and frequency distributions. Parametric and nonparametric inferential statistics. Confidence intervals and hypothesis testing. Prerequisite: MATH 0012 or appropriate placement.

### **Graduate PSMA 6002 Research Methods and Statistical Analysis, 3 credits**

Introduces both quantitative and qualitative research methodologies. Topics include descriptive and inferential statistics, issues in sampling and hypothesis testing, analysis of variance, regression and time series analysis, as well as survey design. Computer software is used for statistical analysis.

## **Practical Experience (choose one)**

### **DAVA 4011/8011 Intern in Visual Analytics, 3 credits**

This course provides credit for students participating in an internship experience. As part of the requirements, students are required to give a presentation about their experience in the departmental seminar. Students interested in the internship experience are required to consult the departmental internship adviser. Undergraduate prerequisites: DAVA 3000 and PSYC 3214 are prerequisites with an average 2.5 GPA on each. DAVA 3010, and MATH 1203 (or equivalent) are co-requisites. Graduate prerequisites: DAVA 7000 and PSYC 7214 are prerequisites with an average 2.5 GPA on each. DAVA 6010, and PSMA 6002 (or equivalent) are co-requisites.

### **DAVA 4021/8021 Project in Visual Analytics, 3 credits**

Students participate in a project in visualization and data analysis under the guidance of a faculty member in the Departments of Mathematics and Computer Science or of Psychology. The topic of the project is closely integrated with the learning experience in the prerequisite course on visualization and in the co-requisite courses on data mining and on statistics. The topic is chosen in consultation with faculty guiding the project. Undergraduate prerequisites: DAVA 3000 and PSYC 3214 are prerequisites with an average 2.5 GPA on each. DAVA 3010, and MATH 1203 (or equivalent) are co-requisites. Graduate prerequisites: DAVA 7000 and PSYC 7214 are prerequisites with an average 2.5 GPA on each. DAVA 6010, and PSMA 6002 (or equivalent) are co-requisites.

## **Additional Course**

### **Online**

It can be substituted if the student has other interests.

### **Undergraduate ENGL 2516 Business Writing, 3 credits**

Communication for the business world, such as letters, resumes, memos, electronic communication, short and long reports.

### **Graduate PSMA 6003 Public Policy Process, Analysis and Evaluation, 3 credits**

The administration of public policy depends on knowledge of the policy process. This course focuses on those stages of the policy process of most interest to public administration, specifically policy formation, implementation and evaluation. Among the questions to be addressed: How are programs designed? What happens after a policy is made? What methods are used to measure and assess public policy outcomes? What are the methodological, theoretical, political, administrative and ethical problems encountered in policy analysis? The course draws on a variety of substantive policy areas for illustration purposes. Students are encouraged to relate the general material of the course to their specific policy interests.

## **Undergraduate On-campus**

### **AART 1223 2-D Design and Color**

Development of visual literacy with regard to the ability to construct, interpret and verbalize the concepts involved in image making. Concepts covered will relate to all fields in the visual arts.

Examples of fine and applied art will be analyzed using the principles and elements of two dimensional design and color theory. 3 credits

### **BITM 2701 Management Information Systems**

Role of technology in the management process. Introduction to the basic concepts of computer hardware and software. A significant part of the course deals with the use of Windows applications, spreadsheets, database, word processing and Internet-related tools. Emerging ethical issues in technology are treated. Offered: Fall, Spring. 3 credits

### **BITM 3727 Advanced Business Software Tools**

This course will teach advanced topics in spreadsheet (Excel) design/programming. The course will show students how to use Visual Basic for Applications (VBA) to build functionally rich spreadsheets. In addition, the course will show how VBA can also be used with a database tool (Access) for building user-friendly applications. Prerequisite: BITM 2701 or permission of the instructor. Offered: Fall, Spring. 3 credits

### **BMIE 3716 Access Database Application Development**

Learn to manage information using a relational database. Gain the knowledge and expertise to develop simple to complex queries, data entry forms and reports. Database design and the importance of referential integrity are stressed. 3 credits

### **COGR 3323 Presentation Graphics**

Introduction to communication of information through visual symbols, including charts and graphics. Presentation, business and information graphics are taught within the context of professional and ethical standards using professional computer systems and software. 3 credits

### **CSAS 4115 Databases**

Modern relational databases. Relational algebra, views and queries, normal forms and normalization, tuning and optimization. The entity-relationship model and database design. Overview of other approaches, especially object-oriented databases, data warehouses and data mining, distributed databases and very large applications. Group project, both design and implementation, in an SQL-based environment, such as Access or Oracle. Prerequisites: CSAS 2124, 2126, MATH 1611 or permission of department chair. 3 credits

## **Graduate On-campus**

### **COGR 6323 Presentation Graphics**

This course introduces students to the communication of information through visual symbols, including charts and graphics. Presentation, business and information graphics are taught within the context of professional and ethical standards using professional systems and software. 3 credits

### **COST 7220 Effective Presentations**

This class features a broad study of speaking and listening skills within corporations, and public and governmental agencies. Topics include: building a professional image, nonverbal code systems, corporate strategies and tactics, formal and informal speaking situations, preparation and delivery of spoken messages, analysis of speech qualities and improvement of individual speaking skills. 3 credits

### **EDST 6215 Computer Graphics**

Create, manipulate, and enhance graphic images suitable for printed publications, electronic presentations, and multimedia applications including Web pages with Microsoft Image Composer. Plan and design animated images using Microsoft GIF Animator bringing all learned knowledge together by creating Macromedia Flash movies. 3 credits

### **EDST 6304 Production I: Visual Communication Design**

An introduction to visual communication that provides students with the needed skills to design, produce, practice, and present creative products utilizing a variety of electronic media. The importance of developing visual literacy through practice in interactive media, print, video, digital photography and presentation will be a focus. From typography and layout to color and composition, an array of design elements will be explored in relationship to constructing a clear channel of communication for maximizing student learning. 3 credits

### **ENVL 3150 Geographic Information Systems**

Geographic Information Systems are mapping technologies used in a variety of professional fields. In this course, students will acquire basic GIS software skills for representing and interpreting data on maps. Individual and group projects emphasize real-world applications, 3 credits.

### **GMHS 7604 Survey Design in Health Care**

The primary focus of this course is on development a survey instrument. Theoretical and practical issues related to the development, validation and implementation of research surveys will be addressed. Key issues include: question construction, questionnaire design, validating and piloting a new survey and survey data collection methods. 3 credits