

Game Science and Design (GSND)

GSND 1990. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GSND 2990. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GSND 3990. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GSND 4990. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GSND 5110. Game Design and Analysis. (4 Hours)

Provides theoretical background and foundation for analyzing and designing games. Examines fundamental domains that are necessary to understand what games are and how they affect players, including but not limited to interface design, level design, narrative, learning, and culture. Presents relevant concepts and frameworks from a wide variety of disciplines—psychology, phenomenology, sociology, anthropology, media studies, affect theories, learning theories, and theories of motivation—for each domain. Explains the core elements of game design, introduces students to formal abstract design tools, explores several models of design process and iteration, and offers students an opportunity to practice game design in groups.

Corequisite(s): GSND 5111, GSND 5112

GSND 5111. Seminar for GSND 5110. (1 Hour)

Offers students an opportunity to discuss and analyze selected games, applying concepts from GSND 5110. Exposes students to a varied mix of AAA and indie titles and demonstrates how to analyze and appreciate them. Open to seniors; restricted to students in selected colleges.

Corequisite(s): GSND 5110

GSND 5112. Recitation for GSND 5110. (0 Hours)

Requires students to familiarize themselves with industry-standard game development tools and to demonstrate their familiarity by developing a simple game. Participation in the recitation is integral to success in GSND 5110.

Corequisite(s): GSND 5110

GSND 5122. Business Models in the Game Industry. (1 Hour)

Examines the underlying business structure of the interactive digital entertainment industry and the characteristics of the various participants, notably developers and publishers. Seeks to deliver insight into key business models within the game industry and how the economic challenges interact. Explores the game business landscape across the industry spectrum, ranging from AAA, mobile, casual to indie development. Examines market strategies currently in practice and how they are linked with game analytics. Topics range from retail vs. online, free-to-play modes vs. pay-to-play, as well as basic monetization and distribution channels. Designed to serve as an overview of the various stakeholders in the industry and how they interact.

GSND 5130. Mixed Research Methods for Games. (4 Hours)

Focuses on methods and methodologies from human-computer interaction (HCI) and their use in different applications, including apps, web applications, games, and virtual worlds. Covers the basics of user-oriented evaluation, associated topics, and usability methods. Introduces the design process, usability heuristics, HCI paradigms, task models, and cognitive models. Examines quantitative and qualitative analysis of data. Offers students an opportunity to delve into experimental design, institutional review board approvals, ethics, research subject recruitment, and experiment implementations. Applies concepts through concrete projects, case examples, and exercises. Expects students to be running assignments continually and trying out different evaluation methods and methodologies.

Corequisite(s): GSND 5131

GSND 5131. Recitation for GSND 5130. (0 Hours)

Requires students to familiarize themselves with statistical analysis software and to demonstrate their ability to use the software and statistics by analyzing an existing data set retrieved from a game study. Participation in the recitation is integral to success in GSND 5130.

Corequisite(s): GSND 5130

GSND 6000. Advanced Topics in Game Design. (1-4 Hours)

Explores a variety of advanced topics in game design, including the multimedia, multidisciplinary nature of games. Taught by faculty according to their research interests and expertise.

GSND 6001. Advanced Topics in Game Science. (1-4 Hours)

Explores a variety of advanced topics in game science, which includes game user research, game analytics, the psychology of play, and more generally scientific methods to study and understand players and games. Taught by faculty according to their research interests and expertise. May be repeated once for a maximum of eight semester credits.

GSND 6225. Applied Game Design. (4 Hours)

Focuses on the design and development of applied games that effectively and ethically utilize the motivational characteristics of entertainment games to meet beneficial, nonentertainment outcomes for its players (such as serious games, gamification, games for social change, games for health, game-based learning, etc.). Studies and applies related learning and motivational theories and paradigms from larger academic fields, a selection of relevant board and digital game mechanics, salient applied game design cases, and preexisting applied game design and assessment methods. Culminates in a portfolio-building final project, during which the students apply the course materials within a simplified applied game development process.

GSND 6240. Exploratory Concept Design. (4 Hours)

Explores the process of designing new modalities of interaction utilizing novel uses of established technology, e.g., pervasive and affective technologies. Focuses on philosophy and practice of creating and evaluating experimental interactions. Recontextualizes gameplay concepts through permutations of basic elements such as controls, platforms, cameras, interfaces, etc. Leverages constraints as vehicles to push the boundaries of accepted design. Explores four key approaches to experimental interaction through course projects and assignments: discovering, examining, and exploring potential new technologies and interaction principles; rapidly designing and prototyping experimental interactions; pitching, justifying, and explaining designs and prototypes to others; and addressing new technologies and forms of interaction from a research perspective, focusing on their larger implications and potential impact on play.

GSND 6250. Spatial and Temporal Design. (4 Hours)

Explores the development and understanding of spaces used by people in 3D and 2D virtual environments. Uses an iterative process of making, criticizing, experiencing, and analyzing spatial form; compositional ideas for form making; and critical thinking. Offers students an opportunity to develop the arbitrary, yet necessary, mind-set needed to make assumptions about aesthetic spatial values and expected player behaviors. Analyzes the connection between spatial-aesthetic elements and their effects on players' psyches. Experiments with how spaces, textures, shapes, and colors can support different synchronous moods. Explores how to shape spaces that fit the rational, emotional, and behavioral profile of different types of players. Applies concepts learned from architecture and game-level design to extend students' creative and critical abilities.

GSND 6320. Psychology of Play. (4 Hours)

Explores theories of perception, motivation, needs, learning, goals, and belief systems as they pertain to games and play. Examines psychological principles, including visual and audio perception, emotions, behavior, personality, and the more recent scientific discoveries around psychological models explaining play behavior or motivation theories behind play. Introduces how players learn in and from games based on the relationship of play to learning theories. Forms a solid theoretical basis for a new segmentation tool—psychographics. Explores visual and cultural archetypes, digging into comics, movie sets, and cartoons to distillate what makes people tick in certain ways relating to universal theories of perception and gestalt theories. Applies the theories through critical analysis of play behavior and games.

Prerequisite(s): GSND 5110 with a minimum grade of D- or GSND 5110 with a minimum grade of C- (Graduate)

GSND 6330. Player Experience. (4 Hours)

Focuses on topics of player psychology—cognition; memory; emotions; attention; and game-focused theories such as engagement, fun, user experience, player-need-satisfaction model, and flow. The development cycle of any game relies on the understanding of the players, the target market of the game product. Covers game usability engineering and game-specific evaluation methods, such as play testing, rapid iterative testing and evaluation (RITE), play-heuristic evaluation, and retrospective play reviews. Offers students an opportunity to learn how to analyze qualitative and quantitative data and to apply parametric and nonparametric statistical evaluation methods, qualitative data coding and analysis, and descriptive statistics. Requires students to apply visualization techniques of data and reporting.

Prerequisite(s): GSND 5130 with a minimum grade of D- or GSND 5130 with a minimum grade of C- (Graduate) or (CS 5340 with a minimum grade of C- ; CS 6350 with a minimum grade of C-)

Corequisite(s): GSND 6331

GSND 6331. Recitation for GSND 6330. (0 Hours)

Requires students to familiarize themselves with survey instruments and data visualization techniques. Participation in the recitation is integral to success in GSND 6330.

Corequisite(s): GSND 6330

GSND 6340. Biometrics of Design. (4 Hours)

Focuses on sensing methods for measuring physiological function, interpreting data from these methods and implementing them in games and designed experiences. Covers the fundamentals of sensor measurement, data quality, analysis, interpretation for user experience studies and integration for driving game mechanics. Examines quantitative data analysis and categorical decision making based on different types of biosensor data. Offers students opportunities to experience different sensing methods, integrating them into their own games, experiments, or experiences and interpreting data for a final project and use in their own future design and experimental work.

Prerequisite(s): GSND 5130 with a minimum grade of C-

GSND 6350. Data-Driven Game Design. (4 Hours)

Introduces the topic of game data science and the process of analysis with data science. Focuses on defining and understanding the player experience using game log data. Examines how gameplay data can be used to discover and communicate player behavioral patterns with the goal of supporting decision management, driving action, and/or improving game quality. Covers the fundamental tools, methods, and principles of game data science and data-driven player modeling including the knowledge-discovery process, data collection, feature extraction and selection, pattern recognition to aid in prediction and churn analysis, visualization, and reporting. Covers analytics across game forms, notably online games and delivery platforms. Presents analytical tools and visualization tools that analysts use within the game development pipeline.

GSND 6460. Generative Game Design. (4 Hours)

Studies principles of procedural content generation and generative methods, including modular design, the role of randomness in design, and designing for emergence. Examines the role of generative design in games and its impact on both designers and players. Through assignments and a semester-long project, encourages student creation of generative systems for playful experiences. In advanced course assignments, students are expected to evaluate the experience by applying game analytics and metrics and conducting user evaluations.

GSND 6520. 3D Modeling and Asset Creation Principles. (4 Hours)

Introduces the principles of 3D computer modeling and asset creation. Class lectures and demonstrations are accompanied by substantial hands-on exploration. Offers students an opportunity to gain fundamental skills for modeling, surfacing, lighting, and rendering. Projects progress from creating simple geometric objects to exploring systems for developing more complex assets, including characters and virtual environments. Topics include polygonal surface modeling tools/techniques, topology/edge flow, retopology, UV layout, surfacing/materials, lighting, physically based rendering and asset optimization for games, and real-time applications.

GSND 6962. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GSND 6984. Research. (1-4 Hours)

Offers students an opportunity to conduct research under faculty supervision. May be repeated up to four times.

GSND 7976. Directed Study. (1-4 Hours)

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

GSND 7980. Capstone. (4 Hours)

Offers students an opportunity to work collaboratively on a project that showcases their game design and research skills. Projects integrate both the "science" and "design" aspects of the discipline. Students define and scope a project through appropriate research questions or hypotheses, as well as discuss the project in consideration of the preexisting literature. Presents effective project management practices for a large-scale team project. Encourages students to present and demonstrate their work at festivals, conferences, exhibitions, etc. Requires a research proposal prior to registration.

GSND 7986. Research. (0 Hours)

Offers students an opportunity to conduct full-time research under faculty supervision.

GSND 7990. Thesis. (4 Hours)

Focuses on preparing a master's thesis under faculty supervision.

GSND 7995. Games Project. (4 Hours)

Offers students an opportunity to obtain practical experience working on a research-driven game design project with a faculty member, resulting in a self-published game and a research paper. Involves multiple aspects of game development including level design; programming; art; audio design and project management; and game research such as research design, data analysis, and academic dissemination. Offers students regular critiques and feedback on their emerging projects. May be repeated once.

GSND 7996. Thesis Continuation - Half-Time. (0 Hours)

Offers continued work on the thesis project.

Prerequisite(s): GSND 7990 with a minimum grade of C-