School of Art and Design

Studio Art

**ART 100, 200, 300, 400 - Special Topics in Art** 2-4 hours. Topics and issues not covered in other courses are explored. Topics vary from one term to another.

**ART 101 - Foundation I** 8 hours. All BFA students are required to take Foundation. The year-long experience is an expansive course in studio practice and field experience focused on hands-on skill building using low-tech materials to cultivate an understanding of basic artistic principles, idea and concept evolution. Studio practice is augmented by personal research, studies in art history and contemporary art practice. BFA candidates are accepted into that program via portfolio review and academic qualifications.

**ART 102 - Foundation II** 8 hours. All BFA students are required to take Foundations II, a series of four, rotating, topic-specific studio workshops conducted by Art & Design faculty. These workshops address 2-D, 3-D, and 4-D Concepts. Topics vary from year to year. BFA candidates are accepted into that program via portfolio review and academic qualifications. Prerequisite: ART 101.

**ART 111 - Introduction to Drawing** 4 hours. Studio work in painting and drawing. A general course for beginners investigating the individual's ideas in various media. (C)

**ART 121 - Basic 3-D Sculpture** 4 hours. A course focusing on idea development, using both traditional and nontraditional three-dimensional materials. (C)

**ART 133 - Basic Black and White Photography** 4 hours. Introduces students to the basic elements of photography and fundamental camera and darkroom techniques. Emphasis on black and white photography as an interpretive medium. (C)

**ART 161 - Introduction to Printmaking** 4 hours. This course is designed to introduce students to the basic processes of printmaking. The students will explore numerous printmaking methods, from the traditional monotype, relief (wood block), to intaglio (dry point, etching). Students will also focus on developing personal images that relate to these techniques through intensive projects.

**ART 201 - Introduction to Handbuilding** 4 hours. This course covers an extensive range of clay construction processes exclusive of the wheel. Fundamental problems in ceramics such as timing, gravity and weight are experienced in assignments that explore basic sculptural concepts. Students are introduced to historic and contemporary models to understand the possibilities offered by ceramic materials. Basic ceramic processes from glaze mixing to kiln firing are experienced within the context of experimental materials exploration.

**ART 203 - Introduction to Wheel** 4 hours. In this course, the potter's wheel is used as the forming process for making vessels expressive of the visual, tactile, and intellectual possibilities available through the medium. Provided is a direct experience with process and materials that teach necessary skills and techniques to enable students to correlate the hand and eye with the mind. The objective of the course is to help students develop creative ideas and concepts into works of art. Historical references are also explored. (Fall and Spring)
ART 211 - Introduction to Design 4 hours. Design is the synthesis of a rational and intuitive process that communicates ideas, emotion, experience, and a strategic message to an intended audience. This course introduces students to the history, theory, and process of design, including its roles and responsibilities within society. We explore the fundamentals of typography, grid structure, visual perception, visual language, hierarchy of information, and sensitivity to forms and their aesthetic function. Conceptual and applied problem-solving projects develop an awareness and understanding of the design process while incorporating the use of current design-related software and hardware. Work is produced in a variety of digital and print media, considering two and three dimensional form as well as the element of time. (Fall and Spring)

ART 218 - Introduction to Photography 4 hours. In this course, students will learn basic photographic skills including camera function, film exposure, film development, and essential black and white darkroom techniques. Through class discussions, book and slide presentations, photographic techniques and ideas. In frequent class critiques, students are encouraged to participate in a dialogue that will help them to develop the vocabulary and visualization skill necessary for critical evaluation of photographic work. (Fall and Spring)

ART 225 - Introduction to Print Media 4 hours. This course is focused on image making and image processing in relation to experiencing a broad range of printmaking processes and forms. It provides an introduction to the tools, technologies, and concepts necessary to develop the skills to make images within a contemporary print framework. Practices including woodcut, etching, lithography, monoprints, and new digital inkjet print technologies will be investigated. Printed images will evolve by working with a combination of hand and digital processes, with ink and with computer software, thus allowing the print to be understood as both physical and electronic process. Ideas inherent to the process of printmaking such as reproduction, translation, synthesis, remixing, proofing, recombination, and collage form the basis for discussion and inquiry. (Fall and Spring)

ART 232 - Introduction to Time Media 4 hours. A studio course for students interested in working with time based media such as video, sound, computer animation and the web. Utilizing a number of unique image and sound processing tools and working between both digital and analog systems, students produce projects that emphasize creative linkages between sound, image, animation, computer music, and time. Projects may take a variety of forms including videotapes, audio CDs, video installation, web animations, and performance. Students are encouraged to delve deeply into their own creative process and to uncover the many strategies used in the production of art in the contemporary electronic arts studio. Time Media promotes synergistic, heuristic and creative approaches to technology and so accordingly NO previous experience in video, computers or music is needed for enrollment in this course.

ART 246 - Introduction to Painting 4 hours. In this course students will be introduced to painting within a structure that allows for the concurrent development of their technical and conceptual skills. Through a series of projects designed to explore the richness of painting in oil and/or water media, student will work towards proficiency with paint and gain confidence in the production and realization of ideas. Work will be done from observation, from the imagination, and from a variety of viewpoint and techniques. Discussions, reading, field trips, and critiques will enhance student's knowledge of the critical dialogs surrounding painting, and will expand the notion of what painting can be.
ART 255 - Introduction to Sculpture 4 hours. An introduction to the possibilities associated with contemporary sculptural practice, with an emphasis on the development of ideas and conceptual reasoning, and the safe usage of materials and processes. A wide range of techniques will be covered, including structure and fabrication, mold making and casting, and the consideration of space, site, interaction, and context. May not be repeated for credit. (Fall and Spring)

ART 261 - Introduction to Glass Blowing 4 hours. This class offers an introductory experimental approach to glass blowing. Students will learn the fundamental skills of gathering, centering, and shaping hot glass as well as cold working processes, sawing, grinding, drilling and polishing. Class instruction will concentrate on the physical properties of this unique medium: fluidity, transparency, light, optics, refraction, strength, and fragility. Discussions, field trips, slide presentations, critiques and demonstrations are at the core of developing a vocabulary with this malleable material.

ART 264 - Introduction to Glass Casting 4 hours. This course will prepare the savvy student with all the skills they will need to express themselves in cast glass. That's right pouring the 2000 degree hot glass into molds made of loose sand, rigid sand, plaster, silica and zircar. Positive images will be realized in clay, wax and found objects. Intensive instruction in modeling and mold making will facilitate artistic expression.

ART 265 - Fundamental Glassblowing for Sculptors I 4 hours. Class will focus on individual expression of ideas using glass as a medium. Emphasis will be placed on skill development, experimentation and technical development to suite each individual. Demonstrations, slides and lectures will center around traditional and non-traditional glassworking techniques for the artist. May be repeated one time for credit.

ART 266 - Glassblowing for Sculptors II 4 hours. Class will focus on more advanced glass working processes, including color work, grinding, polishing and sandblasting.

ART 282 - Figure Drawing 4 hours. A study of the expressive possibilities of the human form through drawing. Students will explore the figure in many ways with a variety of drawing media. From anatomical study and gesture to portraiture and narrative, this course will investigate the powerful history of figurative art and its potential for individual expression. Fundamental drawing and visual language skills are stressed. This course fulfills the drawing requirement. Prerequisite: Completion of an Art Foundation Program or permission of instructor.

ART 283 - Drawing: Observation to Abstraction 4 hours. An investigation of the ways in which perceptual study can lead to pure abstraction. Through observational drawing and formal analysis. Students will discover the abstract principles that exist in all visual imagery. Assignments cover a broad range of drawing techniques and concepts including biomorphic, geometric, and conceptual abstraction. The potential for abstraction to communicate ideas will be explored. Fundamental drawing and visual language skills are stressed. This course fulfills the drawing requirement. Prerequisite: Completion of an Art Foundation Program or permission of instructor.

ART 284 - Drawing: Analyzing Nature 4 hours. This course covers both technical and conceptual aspects of drawing through the investigation and analysis of natural forms. Subjects range from found objects in nature to microscopic materials, the landscape, and the human body.
Emphasis is placed on integrating technical mastery of the visual elements of drawing with expressive content, while working with a wide variety of materials. Fundamental drawing and visual language skills are stressed. This course fulfills the drawing requirement. Prerequisite: Completion of an Art Foundation Program or permission of instructor.

**ART 287 - Beginning Neon Fabrication** 4 hours. This three-week course will be an introduction to the fundamentals of luminous tube fabrication. Students will learn fundamental glass bending, pattern forming and tube processing (bombarding). The focus of this course will be on safe studio practice and the safe installation of neon work. We will install completed works both inside and outdoors, weather permitting. This is not a sign making class; its emphasis is on idea-oriented sculptural and installation work. (Offered only in Summer)

**ART 288 - Visual Communications** 4 hours. This Sophomore-level Visual Communications course introduces College of Business Marketing majors to the history, theory, and visual language of design, including its applied roles and responsibilities within society. This course exposes students to the value and function of design, which builds from the synthesis of a rational and intuitive process that communicates ideas, emotion, experience, and a strategic message to an intended audience. Students will explore some of the fundamentals of typography, visual perception, visual language, and sensitivity to content, form and function, as well as the relationship of client to designer within the marketing process. Conceptual and applied problem-solving projects will develop an awareness and understanding of this communications relationship while incorporating the use of current design-related software and hardware. Not open to BFA students.

**ART 301 - Ceramic Sculpture I** 4 hours. This course emphasizes the rigorous development of conceptual skills with the goal of developing an individual approach to a full integration of ideas, material and process. Students are encouraged to experiment with different strategies, including installation work, mixed-media projects, and a variety of traditional ceramic techniques. Construction and firing techniques are explored as well. Prerequisite: ART 201 or 202. (Fall and Spring)

**ART 302 - Ceramic Sculpture II** 4 hours. Continuation of ART 301. Prerequisite: ART 201 or 202.

**ART 303 - Ceramic Tile** 4 hours. Ceramic tile is a potent form of artistic inquiry that offers students an alternative approach to clay not covered in traditional pottery or sculpture courses. The course challenges assumptions about tile, presenting ideas of space, shape modulation, movement, repetition, density, image, color and texture. Students will address problems involved in planning, fabricating, and installing large projects. Prerequisite: ART 201 or 202. (Fall or Spring)

**ART 304 - Ceramic Color and Surface** 4 hours. This course focuses on the possibilities that ceramic materials offer within a studio-based class. The experimental use of materials as well as traditional techniques are explored to develop a personal approach to glaze and surface. Projects can include functional or sculptural work. (Fall or Spring)

**ART 305 - Ceramic Pottery I** 4 hours. Through an exploration of pottery form this course addresses artistic inquiry, studio practice, and the genre of functional ceramics. Issues relative to ceramic history, contemporary material culture, and craft theory are part of the dialogue. Primarily wheel based, these classes may also include casting and handbuilding systems. Prerequisite: ART 203. (Fall and Spring)
ART 306 - Ceramic Pottery II 4 hours. Continuation of Ceramic Pottery I. Prerequisite: ART 203; ART 305 recommended. (Spring)

ART 307 - Ceramic Systems 4 hours. This course will use mold forming processes as the primary system to develop work in ceramics. Sculpture or vessel making may be the focus dependent upon instructional point of view.

ART 308 - Alfred Summer Ceramics: Sculpture Workshop 4 hours. Open to students with prior experience in ceramic sculpture who wish to pursue individually directed projects in consultation with Alfred University faculty and visiting artists. Participants will work alongside the artists-in-residence in an open studio environment. Demonstrations, lectures, and technical support are provided by Alfred MFA students. Runs concurrently with ART 310 - Alfred Summer Ceramics. Lectures, demonstrations, and other activities are open to participants in both sessions. (Summer)

ART 310 - Alfred Summer Ceramics 4 hours. Open to students of all levels of expertise. The program, a four-week intensive summer session, offers a comprehensive ceramic experience ranging from ceramic art history, and glaze calculation, to an expansive experience working with clay fabrication techniques. Those who attend Alfred Summer School will be given personal studio space and an opportunity to deepen their understanding of clay and glaze by firing in gas, electric, wood, raku and soda kilns. Participants work alongside artists-in-residence in an open studio environment where students can pursue self-directed projects. Technical support provided by Alfred MFA students in kiln firing, moldmaking and casting; slide lectures and discussion by faculty and guest artists will regularly punctuate the studio experience. (Summer)

ART 314 - Junior Design Studio 4 hours. Designers command visual language to inform, identify, educate, entertain, and inspire. Junior Design Studio explores a variety of complex communication problems for interpretation and subsequent visual representation. Students will advance their knowledge of typography, grid structure, visual perception, hierarchy of information, and sensitivity to content, form, and function. Content for projects simulates the relationship between designers, clients and the world in which we live. Students develop research methods, technical skills, and presentation skills. Work will be produced in print and web media, considering 2- and 3-dimensional form as well as the element of time. Design solutions will incorporate the use of current design-related software and hardware while embracing the processes and tools used in other areas of communication such as video, sonic and interactive media. Prerequisite: ART 211 or 212. Two prior courses in Design, Video/Sonic, or Print Media Studio are recommended. May be taken up to four times for credit. (Fall and Spring)

ART 315 - Branding and Corporate Identity 4 hours. Brand is the proprietary visual and verbal, emotional, rational, and cultural image that is associated with a service, company, or a product. Branding and Corporate Identity introduces students to the history, methodology, and application of brand strategy, visual and verbal brand development, and the role of design in creating brand essence, distinction, and identity. This course explores the components of successful, integrated brands through conceptual and applied projects which build upon an awareness of the fundamentals of typography, visual perception, sensitivity to form, structure, and hierarchy of information. Work produced includes the application of brand within digital, print media, video, sonic, and interactive media, as applied to both two and three dimensional form. Prerequisite: at least one Sophomore Design, Video/Sonic, or Print Media Studio or permission of instructor. (Fall and/or Spring)
ART 316 - Design for Business Vision 4 hours. Design is a profession based on concepts: on helping to define an opportunity, then developing a solution that will fulfill it. Subsequently, design includes the identification and management of the team that will bring it to life, whether the form is a product, communication, event, or place. From an entrepreneur designing an inventive new product, to an environmentalist designing a better way to interact with our national forests, the roles of design and marketing intermingle to form a cohesive team. This course puts together marketing students from the College of Business and design students, from the School of Art and Design into a union that investigates new opportunities in design.

ART 318 - Alternative Process 4 hours. This course is an introduction to alternative methods of black & white printing. Students learn the basics of negative enlargement, including an introduction to digital imaging and manipulation as well as theories of negative scales. The course also covers paper, sensitization and the different chemistry involved in each of the processes. Printing methods include cyanotype, Van Dyke brown, kallitype, gum bichromate, platinum/palladium and printing out paper. Prerequisite: ART 218. (Fall)

ART 319 - Color Photography 4 hours. Students learn C41 film processing and RA4 chromogenic print processing using a 30" x 40" color processor with an emphasis on mastering color correction in shooting and printing situations, including daylight, tungsten, flash and fluorescent light sources. Students are encouraged to use color experimentally, such as night photography, painting with light, manipulating development, large format printing and durations printing. Prerequisite: ART 218. (Fall)

ART 320 - Advanced Black and White 4 hours. This course is designed to give students the opportunity to test photographic materials and equipment leading to the mastery of essential photographic skills. Students begin testing their individual camera, film, and paper preferences to establish a personalized ASA, film development time and print development time. This leads into a modified zone system and densitometry. Students experiment with a variety of films as well as different papers, paper developers, and chemical additives. Prerequisite: ART 218. (Spring)

ART 321 - View Camera 4 hours. This course is an introduction to the view camera, large format photographic imaging. Each student in the class will be issued a 4"x5" view camera, provided by the photography department. The view camera is a unique photographic tool, with a multitude of commercial and creative possibilities. Through the course of the semester, student will learn the mechanical properties of the camera, and how to use these properties to elevate their creative potential. Also, students will be introduced to some theories and techniques of negative making, including the zone system, and other methods of film exposure and development. As the semester progresses, various printing techniques will be introduced designed to help students maximize the potential of the camera and their own photographic visions. Prerequisite: ART 218.

ART 322 - Digital Photography 4 hours. This is a course in the fundamentals of digital photography, designed for students with intermediate to advanced experience in "chemical" photography. Students will learn basic skills in imaging software (Adobe Photoshop), shooting with digital cameras, scanning and digital output, and then learn to apply these skills in conceptual art practice. Digital imaging will be explored in the context of photographic history, as well as contemporary art practice and theory.
ART 323 - Studio Lighting 2 hours. Principles of light and the clean-slate nature of the studio will be explored, along with subject, background, and studio tools. Digital camera fluency will provide necessary feedback. A self-directed project is required. Prerequisite: ART 218.

ART 325 - Advanced Print Media 4 hours. An extensive investigation into the traditional and non-traditional uses of materials and processes that grow out of the concepts inherent in kinetic, photographic and electronic printmaking processes. The focus is on issues involving specific forms of print media (book, print-suite, single print, mass production, CD-ROM, print installation). Time and instruction provided help to deepen students experience in one or more printmaking processes including etching, lithography, woodcut, and digital inkjet technologies. Content varies from instructor to instructor. At least one Sophomore Design, Video/Sonic, or Print Media Studio is required or permission of instructor. ART 225 highly recommended. May be repeated once for credit. (Fall and Spring)

ART 328 - Artists Multiples 4 hours. This advanced course explores ideas about artists' books and a wide range of printed multiple forms including objects, installations, CD-ROM and DVD. The notion of the multiple is explored in contrast to the traditional fine art print. Offset printing, traditional processes, and new emerging technologies will be utilized to produce work. Ideas inherent to the process of printmaking such as reproduction, translation, synthesis, remixing, proofing, recombination and collage will form the basis for discussion and inquiry. At least one Sophomore Design, Video/Sonic, or Print Media Studio is required or permission of instructor. ART 225 highly recommended. (Spring)

ART 329 - Digital Print Media 4 hours. An exploration of printing activities and techniques that question and expand the interfaces of the traditional print media of lithography, woodcut, and etching with contemporary digital imaging activities and techniques. Through the making of work we will look at how digital technologies affect the contemporary vocabulary of printmaking. We work with moving and still images and with images on paper as well as on the internet. We make, send and receive images as ways of understanding how ideas about print media are expanding, how these same ideas have historically been rooted in notions about communication, and how we can conceive and make print translations that cross traditional media. Prerequisite: At least one Expanded Media Sophomore Design, Video/Sonic, or Print Media Studio or permission of instructor. ART 225 highly recommended. (Fall)

ART 332 - Junior Video 4 hours. An advanced studio course dedicated to working with video as a creative medium. Students explore methods of 'real time' image processing and digital compositing using tools spanning three decades of processor design, all of which can be used in combination to develop unique works of art. Junior Video explores a wide range of theories and traditions including but not limited to: advanced digital image processing, analog video synthesis, advanced computer editing, video installation, lighting, scripting, and a variety of other experimental approaches. Critiques of student work and an investigation of the history of Video Art are of great importance to this course. At least one Expanded Media Sophomore Design, Video/Sonic, or Print Media Studio is required or permission of instructor. ART 232 highly recommended. May be repeated once for credit. (Fall and Spring)

ART 333 - Sound and Image 4 hours. This special topics studio course will explore the creative possibilities found between sound, image, and time.
Courses of Instruction: New York State College of Ceramics

Projects will take form as prints, compact discs, drawings, animations, artists books, scores and most importantly, the many possible hybrids that will undoubtedly spring up in combining these media. Discourse will be based in contemporary questions and linkages between art and technology, structure and sensation, deconstruction and composition, interface and metaphor. Work will be undertaken using digital and non digital technologies exploring relationships between acoustic and image structures, experimenting with strategies and softwares that support the construction and interaction of acoustic elements with elements inherent to the image. Methodologies and techniques will include acoustic forms, mark making systems, digital sampling, scanning, printing, synthesizing, intermodulation and collage. Students will experience working strategies that expresses essential questions concerning the two media and their interrelationship. At least one Expanded Media Sophomore Design, Video/Sonic, or Print Media Studio is required or permission of instructor ART 225, 232 highly recommended (Fall or Spring)

ART 334 - The Reactive Image 4 hours. This special topics course is project-centered and is designed for students who are interested in the convergence of sound, moving and still image, and interactive technologies. It is especially designed for those who are interested in making work that is determined by its interaction with the viewer in an activated and immersive space. This course will lead students to work on a range of tangible and digital interactive projects, from CD-ROM authoring, to interactive still image/video/sound, and computer/sensor-controlled installation/video projection. Students will work with sensor, micro-controllers and other electronic devises to develop their final projects. At least one Expanded Media Sophomore Design, Video/Sonic, or Print Media Studio is required or permission by instructor. (Fall or Spring)

ART 338 - Large Format Digital Imaging 4 hours. Contemporary art making has been profoundly impacted by new digital technologies. This course focuses on how digital print media informs and evolves visual language for artistic expression. Providing each participant with a hands-on opportunity to explore large-format digital printing technologies, it is designed to help create a context in which to ask questions about the nature of dynamic media relative to the making of contemporary printed images. Looking for transitions, collapsing barriers, and sharing vocabulary, artists will consider multiples, sequencing, mark-making, notation, gesture, and narrative concerns within both digital media and traditional printmaking. Further experimentation across media will be investigated. These media may include: drawing, painting, photography, video, animation, multi-media and internet interfaces. Participants will be able to experiment with printing on a variety of handmade papers (up to 36”x 48”) using eight color, permanent ink, large-format, ink jet technology. The course welcomes artists with beginning and advanced technological experience.

ART 339 - Junior Sonic Art 4 hours. An advanced studio course dedicated to working with sound as a creative medium. Not a music course, it is designed for visual art students who wish to explore a wide range of possibilities for working in sound. This course examines many technologies and traditions including but not limited to: digital sound processing, graphic notation, algorithmic synthesis, ambient structures, atmospherics, digital editing, live multi-track recording, and granular synthesis. Critiques of student work and an investigation of the history of experimental sound are of great importance to this course. Prerequisite: At least one Expanded Media Sophomore Design, Video/Sonic, or Print Media Studio or permission of instructor ART 232 highly recommended. May be repeated once for credit. (Fall and Spring)
ART 340 - Web Media 4 hours. This special topics course will introduce the theory and practice of art and art making on the Internet through a focused investigation of web languages and concepts including HTML, CSS (cascading style sheets), and JavaScript to be used in the building of sites and the construction of web page layouts. Web page development will be demonstrated via a wide range of examples covering different types of page layouts. The course will focus on the integration of pages with various medias including video, sound, text, and image. Text based coding and manual layout strategies will help the student to develop the techniques necessary to achieve dynamic page layouts within the conceptual framework of a specific site. This studio will combine layout principles and computer methodologies for web site development. Prerequisite: At least one Sophomore Design, Video/Sonic, or Print Media Studio is required or permission of instructor. (Spring or Fall)

ART 341 - Electronic Projects 2 or 4 hours. This elective course will explore the use of electronic modes of communication available for artists via internet techniques. Students can create an 'internet presence' and focus on using 'electronic transmissions' of their 'data' in the digital space. This will involve the creation and use of different forms of digital art and media via software 'tools'. After the development of 'media' the artist may then explore the type of transmissions available for 'streaming' their data. The focus is for the artist to develop an analytical and dynamical sense of the surrounding 'electronic space'. Individual projects will explore this 'invisible electronic space' and the 'transmission' of artwork. At least one Expanded Media Sophomore Design, Video/Sonic, or Print Media Studio is required or permission of instructor. (Fall or Spring)

ART 343 - Interactive Structures 4 hours. Students will examine interactive art through assignment driven investigations and projects. Interactivity can involve various forms of human engagement from the simplest turning of a switch to trigger computer animations, to the activation of an entire room with sound and images through the movement of a viewer. By investigating the historical and conceptual relationships in which audio, image sequences and interactivity have expanded into installation forms, the class will explore the full potential of what interactive art means. Projects will be computer based and students will ultimately expand their works into installation environments that consider the use of alternative interfaces, projections and screens. Prerequisite: at least one Sophomore Expanded Media Design, Video/Sonic or Print Media studio is required or permission of instructor. (Fall or Spring)

ART 344 - Animation and Interactivity 4 hours. Students will explore the 'database' as a source for creative interactive art production. The class will encompass gathering, listening, documenting, sifting and reordering an array of media and computer based production techniques. Sound, video, animation, and image will be considered through a process of experimental storytelling, and 'deconstruction' via web based, CD-Rom and/or DVD authoring software. This course is a unique opportunity to explore the boundaries of moving and still images, language and sounds through the construction of complex screen interfaces. Projects will be computer based and potentially touch screen accessible. At least one Sophomore Expanded Media Design, Video/Sonic or Print Media studio is required or permission of instructor. May be repeated once for credit. (Spring or Fall)

ART 346 - Junior Painting 4 hours. Junior painting involves intensive exploration into issues of painting and drawing with emphasis on the beginnings of each student's unique means of expression.
Courses of Instruction: New York State College of Ceramics

It is a continuation of the basic painting experience begun in the sophomore year with concentration on problem solving through structured assignments. Students are encouraged to find ways of approaching common experience as well as developing independent work. Sessions are complimented by readings, critiques, presentations, and field trips. May be repeated. Course content varies from instructor to instructor. (Fall and Spring)

ART 347 - Color Theory 4 hours. This course is an in-depth study of the physical and psychological phenomena of color through a series of structured group and individual problems. While paint is the primary media employed, projects range from 2-D to collage and 3-D. An understanding of the relationship of color to ideas is pursued through readings, field trips, discussions, and watching films.

ART 348 - Junior - Mixing Materials 4 hours. From Picasso's cubist collages to Anselem Keifer's lead and straw works, the class combines both traditional and non-traditional painting and drawing materials that enhance narrative structures, work as metaphorical transformations, and the creation of formal dynamic juxtapositions. Projects are designed to encourage exploration of new realms of expression. (Spring)

ART 353 - Advanced Fabrication: Space and Interaction 4 hours. This course continues and expands on the skills related to metal fabrication and its integration with concepts of contemporary sculpture. From objects in space to the sculpting of space itself this course emphasized the creation of work in three dimensions, its interactions and context. Processes include continuation of arc welding skills (stick, MIG, TIG), plasma cutting, cold connections, and exploration of the possibilities of movement, site, and combination of materials. Prerequisite: ART 253. (Fall or Spring)

ART 354 - Junior Metal Sculpture 4 hours. This course explores an in-depth investigation of materials, concepts and techniques used in advanced joinery, foundry process, and fabrication. Students learn to cut, wild, form and cast metals. Materials covered include: steel, stainless steel, brass, bronze, iron and aluminum with an emphasis on stone sculpture in the spring semester. May be repeated once for credit. Project parameters will be adjusted to accommodate students taking the course a second time. Prerequisite ART 253. (Fall and Spring)

ART 361 - Glass Blowing 4 hours. An intermediate-level exploration of glass and combinations of glass and other media as they apply to sculpture. Concentration in hot glass and glass blowing techniques (including color techniques), and mold making. Projects are developed to foster self-determination of ideas in relation to media. Prerequisite: ART 261. (Fall)

ART 362 - Advanced Glass Blowing 4 hours. A continuation of ART 361 that further develops personal expression in glass sculpture. Processes include glass blowing, solid working, mold making, and color, utilizing high-temperature glass enamels. Prerequisite: ART 361. (Spring)

ART 363 - Glass and Light 4 hours. This course is an in-depth investigation into the potential of light as a material and a comprehensive introduction to working with luminous tube technology --a normally commercial process--as a means of sculptural expression. The course examines neon's potential in combination with other materials both traditional and non-traditional as well as sealing, bending, processing of neon tubes, safe installation, and wiring. No prerequisite. (Spring)
ART 364 - Glass Casting 4 hours. An introductory investigation of personal expression through cast glass sculpture with an emphasis on mold making. Students learn open-faced solid glass casting using both loose and rigid sand molds. Topics range from the object and figurative sculpture to geometric abstraction and site-specific environments. (Fall)

ART 365 - Lamp Design 4 hours. The goal of the course is to use the "lamp" format as a medium of creative expression. The course incorporates a variety of material and processes including tube bending, simple electric circuiting and elemental metal and woodworking. No prerequisite. (Fall)

ART 366 - Advanced Glass Casting 4 hours. A continued development of sculptural expression using glass casting techniques. An intense mold making experience casting 3-dimensional glass projects in sand, wax, plaster, latex, and ceramic shell molds. (Spring)

ART 367 - Wood Expands 4 hours. An expansion of what was learned at the sophomore level, integrating concept with craftsmanship to create engaging sculpture. Additional machines will be introduced and used such as the router, biscuit joiner, chainsaw, and lathe, while looking at specific considerations such as scale, how sculpture exists in space, presentation strategies, and personal voice. The projects are designed to give a wide berth for expanded thinking about objects, space, and materials. Prerequisite: ART 267 or permission of instructor. (Fall)

ART 368 - Installation and Expanded Apps 4 hours. Installation deals directly with engaging the viewer via the manipulations of the dimensional space, materials, and the ambient environment. This course includes explorations of a range of spatial strategies to promote an expanded understanding of the way that sculpture is made, presented, and experienced. The projects are designed to give a wide berth for expanded thinking -- conceptually, personally, and material-wise, and may use wood and/or a mix of materials and may be executed on or off campus. Topics covered include artists who have made installations, "technique of the week", building temporary walls, environmental controls, documentation, and creating effective proposals. (Spring)

ART 374 - Advanced Paper/Mixed Media 4 hours. Advanced Paper/Mixed Media involves intensive exploration into issues of art making with emphasis on the development of each student's unique means of expression. It is a continuation of the basic paper/mixed media experience begun in the sophomore year with concentration on problem solving, development of ideas, and conceptual possibilities within the contemporary art practice.

ART 376 - Multi-Media Installation 4 hours. This course explores a range of spatial strategies and encourages an expanded understanding of the way that dimensional artwork is made, presented, and experienced. Installation deals directly with engaging the viewer via the manipulation of space, materials, and light. As appropriate to the ideas, the projects will utilize wood and/or a mix of materials and may be executed both on and off campus. Topics covered may include environmental controls, site specifics, building temporary walls, follow-up documentation, and creating effective proposal packages. Students less familiar may learn the basics of woodworking tools, machines, safety, and processes for building sculpture and installation work. Course may be repeated once for credit. Recommended prerequisite: ART 267 or a 200 level Sculpture course, or permission of the instructor. (Spring)
ART 377 - Foundry, Fabrication, Stone, Sculpture 4 hours. A Junior sculpture course that examines foundry process and practice (lost wax and sand casting) to generate cast forms that are intended to be assembled by welding techniques (MIG&TIG) and glues. These forms can be used alone or in combination with stone. Stone processes will also be covered and can be used in combination or alone as the sculpture. Prerequisite: ART 253, 267, or 274.

ART 381 - Advanced Drawing 4 hours. A topical course providing students an intense immersion in both observational and conceptual drawing practices. Topics may include figure drawing, nature drawing, and drawing systems. May be repeated once for credit, preferably with a different instructor. Course content varies from instructor to instructor. (Fall)

ART 382 - Raw Materials 4 hours. This course concentrates on clay, starting with an understanding of geology as it pertains to the uses of clay in ceramics. It introduces clay body formulation for traditional and experimental applications including casting, throwing, and sculptural uses. This course includes developing formulas for engobes and slips for the surface. 1 1/2 hour lecture plus 2-hour lab. Elective. (Spring)

ART 383 - Glaze Formulation 4 hours. This course introduces the basic science of glaze formulation and the effects of the interaction of commonly used materials. The goal of the course is a fundamental understanding of how glazes are formulated for functional, sculptural or experimental work. 1 1/2-hour lecture plus 1-hour lab. Elective. (Fall)

ART 385 - Internship 1-4 hours.

ART 387 - Summer Travel 4 hours.

ART 388 - Methods in Electronic Arts 2 hours. This elective course is designed to introduce students to the primary software applications and concepts used in the preparation of a wide variety of print and digital media. The course will focus on acquiring the skills necessary to move easily between the most relevant page layout, imaging, video and sound software as well as developing skills in digital file and digital color management. This course is open to all students interested in expanding their knowledge and expertise of software used in the digital arts. It is strongly recommended for beginning as well as advanced students working in Design, Print Media, Sonic, Video and Interactive Arts. (Fall or Spring)

ART 392 - Individual Projects with Freshman Foundation Faculty 2-4 hours. Project or media based independent study with a faculty in the foundations division. This course can only be used for elective credit. It is not intended to replace sophomore, junior or senior studio requirements. Permission of the instructor is required.

ART 393 - Ceramic Art Individual Projects 2-4 hours. Project or media based independent study with a faculty in the ceramic art division. This course can only be used for elective credit. It is not intended to replace sophomore, junior or senior studio requirements. Permission of the instructor is required.

ART 394 - Sculpture and Dimensional Studies Individual Projects 2-4 hours. Project or media based independent study with a faculty in the sculpture and dimensional studies division. This course can only be used for elective credit.
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It is not intended to replace sophomore, junior or senior studio requirements. Permission of the instructor is required.

**ART 395 - Expanded Media Individual Projects** 2-4 hours. Project or media based independent study with a faculty in the expanded media division. This course can only be used for elective credit. It is not intended to replace sophomore, junior or senior studio requirements. Permission of the instructor is required.

**ART 396 - Drawing, Painting, or Photography Individual Projects** 2-4 hours. Project or media based independent study with a faculty in the drawing, painting and photography division. This course can only be used for elective credit. It is not intended to replace sophomore, junior or senior studio requirements. Permission of the instructor is required.

**ART 401 - Senior Studio** 4-6 hours. The senior level studio course content is defined by students near the end of the junior year. Faculty are designated on the basis of the senior proposal.

**ART 450 - Independent Study** 1-4 hours.

**ART 499 - Senior Show** 0 hours. The culminating exhibit for the BFA degree. Prerequisite: 68-72 studio credit hours earned and senior standing in the BFA program.

**ART 481 - Kiln Design** 2 hours. An introduction to the principles of gas kiln design. A kiln is built every year by this class. Students must enroll in both lecture and lab. (Fall)

**ART 482 - Advanced Kiln Design** 2 hours. An introduction to the principles of electric kiln design. Students learn how to build and repair common types of electric kilns. Students must enroll in both lecture and lab. (Spring)

**Art History**

**ARTH 121 - Wild Spirits and Divine Kings** 2 hours. This course introduces students to art from a variety of cultures that Westerners long dismissed as "primitive." The premises that all art performs a function and that artists contribute to the orderly functioning of society allow us to look at Non-Western art without the bias and ethnocentrism that have historically colored our views. The class investigates such aspects of African, Oceanic, Native American and Pre-Columbian art as style and iconography, but focuses on its use in religious, political, and social contexts.

**ARTH 122 - Arts of the Pacific Isles** 2 hours. This course examines the arts of Melanesia, Micronesia, and Polynesia in cultural context, emphasizing their relationship to other aspects of Oceanic societies. Topics will include the men's house and women's art in New Guinea, art and leadership in Island Melanesia, the decorated body in Polynesia, patterns of power in Micronesia, and continuity and change in Pacific art. (C)

**ARTH 123 - Art of China** 2 hours. This quarter-long survey will introduce beginning art history students to the arts of China from the prehistoric period to present day. Among the topics to be discussed will be ancient bronzes and other funerary arts, the classical style of the Han Dynasty, landscape painting in the Song Dynasty and contemporary issues in post-Mao China. The course will consist of lectures, exams and a short research paper. (C)
ARTH 124 - Native American Arts: Spirited Materials and Technologies 2 hours. Native American arts are as numerous as the ecosystems of the continent, and incorrigibly undermine our ability to categorize artifacts. This course introduces students to art from a variety of cultures that Westerners long dismissed as "primitive." Our reevaluation premises that all art performs a function and that artists contribute to the orderly functioning of society. The class is organized by focuses on materials and environmental influences. Particular emphasis will be placed on relating materials, style, and iconography to religious, political, and social contexts. (C)

ARTH 125 - Australian Indigenous Art 2 hours. This course offers an introduction into Australian Indigenous (Aboriginal) Art. We will explore both traditional and contemporary artistic production (painting, sculpture, weaving, photography film) in different contexts, from the sacred realm of ceremony to present day public spheres. We will be looking in what way Aboriginal mythology influenced the art making. At the same time we will be asking questions about relationship between art, culture, and colonization.

ARTH 131 - Power and Authority in the Ancient World 2 hours. This course studies how art and architecture reflect political structures from the ancient Western world. Themes that will be addressed include the concepts of kingship, deifying rulers, class structure, colonial expansion, and political propaganda. We will pay particular attention to how works of art and architecture were made and how they were received in the ancient cultures of Sumer, Egypt, Greece, and Rome. (C)

ARTH 133 - Renaissance-Baroque Survey 2 hours. This quarter-long survey is designed to introduce first-year students to the developments of art and architecture in Europe of the fourteenth through the seventeenth centuries. The course will consist of lectures, exams and a short research paper. (C)

ARTH 135 - Design and the Enlightenment 2 hours. An introduction to the revolutions of the eighteenth century in important technologies, such as those intrinsic to printing, pottery, and building. This course will consider the materials, styles, and social meanings of Wedgwood's pottery, James Watt's steam engines, Baskerville's and Caslon's typefaces, Sheraton's chairs, and Robert Adams' architecture. This first generation of industrial designers and their global impact will be our focus as we look at the larger significance of design.

ARTH 136 - The Role of the Medieval Image 2 hours. This course will investigate the character and function of the image during the Middle Ages. The influences and development of Christian images from its early pagan antecedents to its fruition in Gothic courtly style will be studied. Aspects of learning, propaganda, and piety within European medieval culture will be considered both from clergy and secular patronage.

ARTH 141 - 20th Century Art 2 hours. This class will provide a critical introduction to modern art. It will trace the contexts of modern art movements and explore key themes. We will look at a wide-range of art genres, including painting, sculpture, and photography. (C)

ARTH 142 - Introduction to Design History 2 hours. Looking at artifacts made between 1800 and 2004, the class will examine books, buildings, chairs, paintings, photography, pottery, silver, type design, and videos in order to identify functions and analyze values systems.
We will consider how the ways design expresses aesthetic and moral belief systems and question how new materials and technology influence the way we define "modernity." (C)

**ARTH 143 - Art and Social Ideals** 2 hours. This course will introduce students to the development of the concept of modernism in art and will focus on discussing examples of related utopian visions of an idealized past or an anticipated future. (C)

**ARTH 144 - The Ideal Body** 2 hours.

**ARTH 145 - 19th Century Art** 2 hours. This class will provide a critical survey of nineteenth-century art, a period of rapid and profound change. Some of the topics we will discuss include: the intersection of painting and nationalism, the identity of early photography, and the depiction of modernity. (C)

**ARTH 146 - Modern Sculpture** 2 hours.

**ARTH 147 - Impressionism** 2 hours.

**ARTH 211 - Issues and Debates in Contemporary Art** 3 hours. A topically structured, discussion-based thematic study of issues and debates relevant to major movements and developments in contemporary art. Students are introduced to vital, ongoing conversations within the School as well as a variety of coexisting and competing opinions about investments in art. The course encourages students to develop, strengthen, and present their own views about art. Should be taken Spring Semester sophomore year.

**ARTH 300, 400 - Topics in Art History** 2 or 4 hours. Topics vary from semester to semester. May be repeated for credit.

**ARTH 301 - African Art I** 4 hours. A survey of the arts of sub-Saharan Africa with an emphasis on sculpture. The course focuses on the role art plays in African cultures and also introduces students to a wide range of art forms and styles.

**ARTH 302 - African Art II** 4 hours. Continuation of ARTH 301, a survey of the arts of sub-Saharan Africa.

**ARTH 303 - Oceanic Art** 4 hours. A survey of the arts of Melanesia, Micronesia, Polynesia, and Australia. The course surveys the arts of sculpture, ceramics, and personal adornment and examines their relationship to other aspects of oceanic society.

**ARTH 321 - Topics in Greek and Roman Art and Architecture** 4 hours. A study of art and architecture from ancient Greece and Rome. Among other issues, the course addresses changing attitudes of style, function, and patronage during this period and investigates the influence of social and religious belief. The study of Greek art emphasizes the development of stylistic periods. Roman art study focuses on individual historical periods of various emperors as reflected in the patronage.

**ARTH 322 - Topics in Medieval Art, AD 300-1500** 4 hours. This course explores the medieval image in art with an emphasis on manuscript illumination. Various media, including wall painting, mosaic, enamel work, stained glass, ivory, wood, and (non-architectural) stone sculpture are investigated.
The Early Christian, Byzantine, Early Medieval, Romanesque, and Gothic Eras are studied with regard to the work of art in its cultural and historical context, regional style, iconography, and patronage.

**ARTH 323 - Medieval Architecture, AD 300-1500** 4 hours. This course focuses on architecture and architectural sculpture. It traces the development of Imperial and Byzantine architecture of the Mediterranean region and then investigates early medieval, Romanesque and Gothic architecture. Topics discussed include the imperial tradition, the Pilgrimage Road, the monastic orders, birth of Gothic style under the patronage of Abbott Suger, and the development of High Gothic, both secular and ecclesiastical.

**ARTH 331 - Italian Renaissance Art** 4 hours. An in-depth study of the Renaissance Period and its theories. Artistic developments in Italy are emphasized.

**ARTH 332 - Northern Renaissance Survey** 4 hours.

**ARTH 333 - Baroque Art** 4 hours. This class will look at the art and architecture of 17th century Europe, from Bernini to Rembrandt, and look at the historical, political and religious context of this dynamic era. Among the issues to be discussed will be Counter Reformation spirituality and its impact on religious painting, urban planning and the rise of the modern city, the staging of kingship, the art market, the representation of gender roles and the rise of the art print. Course will consist of lectures, discussions on assigned readings, exams and a short research paper.

**ARTH 342 - Primitivism: A Western Perspective** 4 hours. This course surveys the concept of the "primitive" in Western art from the Enlightenment to the present. Students explore the shifting nature of primitivism, examine the relationship between art and colonial expansion, and critique the formal and thematic appropriation of non-Western artifacts by European and American artists.

**ARTH 343 - Modern Art** 4 hours. Encompassing the movements of Symbolism to Surrealism, this course covers the developments in modern art during the first half of the 20th Century. Students explore such themes as modernity, primitivism, and utopian theory as well as the stylistic developments and formal innovations of this period.

**ARTH 352 - Contemporary Projects in Art** 4 hours. This interactive course will focus on and study the projects of selected contemporary artists. These projects will serve as platforms for investigating issues and problems related to various contemporary art forms and movements including, the embodiment of the viewer, play and reality, new technologies and consciousness, ironic modernism, and the critique of the post-medium condition.

**ARTH 354 - Recent Sculptural Practices** 4 hours. A series of recent projects exploring contemporary issues in sculpture will be the focus of this class. We will be looking an international array of artists, including: Matthew Barney (United States), Robert Irwin (United States), Juan Munoz (Spain), Doris Salcedo (Colombia), Thomas Schutte (Germany), and Rachel Whiteread (Britain). The work of these artists will be examined in the context of larger post-war debates.

**ARTH 362 - History of Photography** 4 hours. A survey course covering the pre-history of photography up to Post Modernism. Required readings directly related to the slide lectures are placed on reserve at Scholes Library. The course is open to Sophomores, Juniors, and Seniors.
ARTH 363 - Ceramics and Cultural Identity: Global Traditions and Innovations 4 hours. A thematic approach to the history of ceramics that is global and cross-disciplinary, designed for students to re-conceive their inheritance and its varied strands of tradition, convention and invention. Topics include ritual objects, tableware and dining customs and the funereal. Evidence will span an enormous range of cultures and era, from ancient to contemporary. The approach of material culture will reveal the complex cultural issues surround the ceramic medium.

ARTH 364 - Design and Culture 1600-1900: Tombstones to Telegraph Poles 4 hours. Trace chair, the coffee mug, and the printed page back in time to consider their significance in America between 1600 and 1900. Consulting primary documents, such as houses, furnishings, and photographs, and contemporary secondary readings, this course will examine the concepts, social meanings, styles, and craftsmanship of American material culture. Different theoretical models of interpretation will complement looking at stuff and learning about history.

ARTH 365 - History of Design II 4 hours. Looking at tiny objects and massive architecture and every thing in a size in-between that was made in the years from 1900 to present, students will be introduced to a global and diverse definition of design. We will ask many questions of many artifacts to determine the value of materials, craftsmanship, consumption and ideology: Is a chair an idea? Does a building’s facade determine the politics of its nation? Is a type design about craftsmanship or mass-consumption? Theoretical, historical and aesthetic readings will assist our study of material evidence and visual culture.

ARTH 370 - (Re)Considering the Ceramic Object 4 hours. This class will attempt to re-map twentieth-century ceramics and its critical place within the broader art system. Our discussions will be based on a range of texts and images, both within and beyond the field of ceramics. Particular emphasis will be placed on recent studio practices.

ARTH 371 - Contemporary Ceramic Art 4 hours. We will investigate developments in studio ceramic art over the past fifty years. Topics include: a commentary on Modernism and materiality, a critique of the postmodern interest in the decorative, and a review of current scholarship in the field. Contemporary Work will be examined in their historical contexts and cultural traditions.

ARTH 372 - Studies in Electronic Arts 4 hours.

ARTH 381 - American Folk Traditions: Vernacular Art/Architecture 4 hours. This course will explore the art of largely self-taught artists in the United States from the earliest colonial period to present day. A variety of media will be discussed including portraiture, tombstone carving, quilts, architecture and furniture design. We will also look at distinctive regional traditions, such as the decorative arts produced by the Shakers and Yard Art produced in the deep South today. Course will consist of lectures, discussions on assigned readings, exams and a research project on which students will present to the class.

ARTH 382 - Women in Art 4 hours. This course considers various gender issues in art history including the role of women artists in western and non-western cultures, feminist re-evaluation of art history, and the existence of a "feminine art." Students are assigned research papers or oral reports on topics generated by readings, lectures, and class discussions. (Cross-listed as WMST 382)
ARTH 383 - Topics in American Art and Architecture 4 hours. Topics concerning aspects of the American character and aspirations as shown through images created by craftsmen, artists and architects from Colonial America and the United States will be discussed. Topics integrate not only traditional fields of painting, sculpture, and architecture but often include house-hold art, furniture, folk art, and crafts. Each topic will slice across a span of cultural time often including Colonial, Early Republic, Civil War, Victorian, Early Modernism, the Great Depression, and Contemporary periods.

ARTH 384 - Strategies of Display: Museums, Fairs, and Fleamarkets 4 hours. Theorizing artistic reception has an added urgency in our era when presentation is the product. Artists need to constantly re-think their own practice in relation to new technologies, new ideas and the resurgence of old ideas. This course will look at how artists have addressed modes and technologies of presentation and how theories of the space of art have played a role in defining culture and cultural institutions. A critical appreciation of light, frames, and framing devices and other exhibition technologies will be surveyed in museums and malls, flea markets, and artist? s homes.

ARTH 392 - Art History Individual Projects 2-4 hours. Project or media based independent study with a faculty in the art history division. This course can only be used for elective credit. It is not intended to replace sophomore, junior or senior studio requirements. Permission of the instructor is required.

ARTH 411 - Pre-Columbian Art 4 hours. A survey course that acquaints students with major monuments and styles of Pre-Columbian American art, including: architecture, sculpture, ceramics, dress, and body adornment Examined are several millennia of pre-contact art traditions in Meso America and South America from earliest art producing cultures to the Aztecs and Incas. The course looks at archaeological contexts and investigates possible meanings for art and written records dating from early periods that enhance our understanding of later cultures.

ARTH 425 - Northern Renaissance Art: Quagmires, Quandaries, and Queries 4 hours. This course will look at some of the major points of debate within Northern Renaissance scholarship (Northern Europe, ca. 1400-1570), beginning with the fabulous "Tres Riches Heures de Duc de Berry" and ending with Brueghel's "Children's Games". Each week will focus on one or two works of art and problems relating to historical context, authorship, techniques of production and interpretation.

ARTH 440 - Ceramics from Arts and Crafts to Modernism, 1876-1929 4 hours. Beginning with the 1876 Philadelphia Centennial Exposition and ending with the 1929 International Exhibition of Ceramic Art, this course will survey tidal shifts in American ceramics, exploring the substance of styles. We will examine claywork in relation to patterns of consumption and emulation, artistic invention, and tradition. We will measure change by looking at expositions in galleries, world's fairs, and museum collections. Original archival research is an important component of the workload.

ARTH 441 - Surrealism and Its Legacies 4 hours. This course will examine the inter-war movement of Surrealism, its symbolist roots and its contemporary manifestations. A wide range of surrealist and dissident surrealist ideas from Andre Breton's manifestos to Georges Bataille's essays will be investigated and related to the artistic innovations of this group.

ARTH 450 - Independent Study 1-4 hours.
ARTH 451 - Object/Objecthood 4 hours. An examination of the changing nature of sculpture in the twentieth century, ranging from formalist object to surrealist fetish and minimalist object to performance "residue." Artists include: Constantin Brancusi, Alberto Giacometti, Donald Judd and Yoko Ono. We will critique the shifting conditions and critical reception of the sculptural object through a series of theoretical texts.

ARTH 453 - Contemporary Art Theory 4 hours. This course surveys developments in Western Art from the late modernism of the post-war era to post-modernist interventions at the end of the 20th Century.

ARTH 461 - Viewing Sculpture: Figurative, Modernist, Minimalist, Performative 4 hours. A close examination of the nature of sculptural viewing over the past 200 years. Sculptural theory is considered alongside contemporary artistic practice, ranging from Antonio Canova's neoclassical figures to Janet Cardiff's audio walks. Primary sources will be used for class discussion, along with Potts' "The Sculptural Imagination". In addition to thinking critically about the phenomenon of viewing, we will investigate the changing attitudes toward sculpture and the broadening definitions of three-dimensional work in the modern period.

ARTH 490 - Issues in Non-Western Art Seminar 4 hours. A round-table seminar based on extensive group discussions and in-depth individual research on non-Western art topics.

ARTH 492 - Contemporary Topics Seminar 4 hours. A round-table seminar based on extensive group discussions and in-depth individual research on significant contemporary events and developments in and around the art world.

ARTH 493 - Art in the Age of Digital Recursion 4 hours. A round-table seminar based on extensive group discussions and in-depth research on recent innovations in technology and how that technology has impacted art production and theory.

ARTH 494 - Pablo Picasso Seminar 4 hours. This course examines issues of representation and reception in the work of Pablo Picasso. Students will critically explore a broad range of Picasso's work, including painting and printmaking, sculpture, and ceramics. This artist, whose production spanned most of the 20th century, will serve as a case-study for discussions on the nature of modern theory and art criticism.

Kazuo Inamori School of Engineering

Biomedical Materials Engineering Science/Ceramic Engineering/ Glass Engineering Science/Materials Science and Engineering

CEMS 107 - Materials Processing 3 hours. An introduction to the behavior and processing of ceramics, glasses, metals, electronic materials and polymers.

CEMS 203 - Introduction to Ceramic Powder Processing 3 hours. An introduction to the fundamental concepts of ceramic powder processing. Concepts are reinforced through a series of experiments investigating colloidal suspension stability and rheology, powder characterization (involving particle size distribution, powder surface area, and powder density), spray drying and compaction of ceramic powder/binder systems, and particle packing behavior of fine and coarse powders. Prerequisite: CEMS 107.
CEMS 214 - Structure and Properties of Materials 3 hours. This course introduces the student to the relationships between the various levels of structure (electronic, atomic, crystal, microstructure and macrostructure) in a material and the influence of structure on properties and performance. The influence of structure on mechanical, electrical, optical, thermal and magnetic properties are discussed in the context of bonding, defects, crystal, micro and macrostructure. A significant aspect is the emphasis on the raw materials from which fuels, engineering polymers, ceramics and metals are derived. Prerequisites: CHEM 106, MATH 152.

CEMS 215 - Microscopy and Microstructural Characterization 3 hours. Students learn how to use optical and scanning electron microscopes for a range of applications. Underlying principles of the interactions of light and electron beams with materials are presented, and these interactions are related to crystal structure and microstructure of materials. Topics covered include mineral, phase, and element identification, characterization of microstructure, measurements of geometrical quantities, determinations of index of refraction, identification of defects, analysis of fracture surfaces, uses of microscopy in quality control, specimen preparation, photography using microscopes. There are two lectures and one lab each week. Prerequisite: CEMS 214 or 216, previously or concurrently.

CEMS 216 - Bonding and Structure of Materials 3 hours. An introduction to the basic principles of solid materials structure. Electronic, atomic, and crystal structure are the primary focus for discussion. Structure is the foundation for understanding the physical and chemical properties of materials and for discussing defects in crystals. Key concepts are bonding within solids, rules that govern packing of atoms to form crystals, crystal structure, techniques for describing material's crystallography and selected properties of crystalline materials. Discussions culminate in an overview of common crystal structures in metals and ceramics.

CEMS 221 - Electrical Engineering Laboratory 3 hours. An introduction to electrical engineering, covering quantitative analysis of DC/AC circuits, power characteristics of single and polyphase AC devices, and design factors for electrically heated kilns and ovens. Amplification is studied through operational amplifiers and simple transistor amplifiers. The laboratory emphasizes basic measurements in electronic circuits and power devices. Prerequisite: PHYS 126. MATH 271 prerequisite or concurrent.

CEMS 235 - Thermodynamics of Materials 3 hours. This course introduces the fundamental concepts of thermodynamics and their application to materials systems. Prerequisites: CHEM 105, 106, MATH 152.

CEMS 237 - Thermal Processes in Materials 3 hours. This course studies the basic principles of high-temperature reactions and processes. The course is divided into several subunits: ternary phase diagrams, surface and interface phenomena, atomic defects in materials, diffusion, and sintering theory. Students will get a solid foundation in each of these areas as well as seeing the interrelation and importance of those principles with respect to a control of the microstructure and properties of materials. Prerequisite: CEMS 235 or CHEM 343.

CEMS 251 - Mechanics of Materials 3 hours. Successfully completing this course enables students to understand the nature of forces acing on objects and to calculate the stresses and strains generated by those forces in simple situations. Situations include classic beam loading as well as more materials-oriented cases such as stresses in dams and reinforced materials (e.g., concrete, composites).
Applications to engineering design and to mechanical testing of materials are demonstrated. Students learn to calculate the variations of stress and strain using Mohr's circle method. Prerequisite: PHYS 125.

**CEMS 301 - Ceramic Science for the Artist** 4 hours. The science and technology of whitewares covering mineralogy, raw material characterization, mixing, suspension behavior and control, rheology and plasticity, forming processes, drying, firing, the use of phase diagrams, thermal stress and microstructural evolution, mechanical properties, and glazing. This course provides the non-engineering student with the practical basis necessary for analyzing problems commonly encountered in the production of whitewares. Homework assignments are practical in nature. The project will require the application of the principles learned in class. Prerequisite: Junior standing in a non-engineering program.

**CEMS 314 - Ceramic Processing Principles** 3 hours. Processing ceramic materials into finished shapes ready for firing is discussed in terms of engineering unit operations and scientific principles. Topics include specifications of raw materials, characteristics of processing additives, particle packing, rheology, milling; mixing, filtration, sizing and spray drying, dry pressing, plastic forming, injection molding, casting processes, and drying. Examples of process systems used and control of defects are discussed. Prerequisite: CEMS 203.

**CEMS 315 - Electronic Ceramics Laboratory** 2 hours. Measurement and analysis of commercially significant electronic components: ferrites, varistors, capacitors, resistors, non-ohmic materials, etc. Laboratory emphasizes real-world conditions, problem solving, and development of engineering judgment. Prerequisites: Junior standing and CEMS 221, or ELEC 220, or CEMS 352.

**CEMS 316 - Chemical Processing in Ceramics** 3 hours. This course provides the knowledge and working understanding of the chemical facts and principles involved in the synthesis of raw materials and the chemical fabrication techniques used in current industrial practice. The discussion focuses attention on both oxide and non-oxide ceramics involved in high-performance structural and electronic applications. The design of chemical processes is emphasized in assignments. Prerequisite: CHEM 106.

**CEMS 318 - Refractories** 3 hours. This course provides technical information concerning the raw materials, processing, microstructure, properties and applications of the principal types of refractories and high-temperature insulations. Technological and engineering factors pertinent to manufacture, process design and control and design of refractory and insulation systems are presented. An understanding of current practice is used as a basis for recognizing refractory needs for design and applications, and areas for research and development of materials for future applications.

**CEMS 322 - Introduction to Glass Science** 3 hours. A survey of the nature of the vitreous state with detailed consideration of structural and kinetic theories of glass formation. Composition-structure-property relationships are emphasized to illustrate how glass compositions can be designed to fulfill a particular set of product requirements. Processes for "post-forming" treatments which further tailor properties are also presented. Prerequisite: CEMS 235.
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CEMS 324 - Mass Transport in Glasses and Melts 3 hours. A thorough discussion of the fundamentals of diffusion processes, which will be followed by discussion of ionic diffusion and ion exchange, gas diffusion, viscosity, ionic conductivity and dielectric relaxation, mechanical relaxation, chemical durability, and weathering in glasses, glass-ceramics, and melts. The effects of both atomistic structure and morphology will be discussed for each of these topics. Prerequisites: CEMS 235, 237 and 322.

CEMS 325 - Glass Laboratory 2 hours. This laboratory prepares students to fabricate and measure the properties of glass correlating composition and property relations, and observing trends. Optical property analysis is emphasized as are novel fabrication techniques such as sol-gel glass design for high-tech applications such as biomedical and photonics. Pre- or co-requisite CEMS 322.

CEMS 328 - Industrial Glass and Glass-Ceramics 3 hours. Topics include glass compositions, raw materials, glass melting, furnace operation, glass forming-container, sheet tubing and pressed ware. Glass product manufacture, glass-to-metal sealing, annealing and tempering, quality control, glass-ceramics, phase transformation, immiscibility, homogeneous and heterogeneous nucleation, crystal growth, and industrial glass-ceramics processes. Prerequisite: CEMS 322.

CEMS 332 - Transport Properties 3 hours. This course introduces the basic principles of transport phenomena (momentum, energy, and mass transport) used in the quantitative solution of engineering problems. Prerequisite: MATH 152.

CEMS 334 - Introduction to Polymers 3 hours. An introduction to the polymeric materials for engineering and industrial use that studies the fundamental classes, processing, properties, and uses of polymeric materials. In addition to the major polymers, specialty polymers for biological, electrical, and high-performance uses are discussed. Necessary organic nomenclature is covered. Prerequisite: CEMS 235 or CHEM 343.

CEMS 336 - Physical Metallurgy I 3 hours. Introduction to the physical and mechanical properties of metals with an emphasis on relating structure to properties. Strength, toughness, ductility, dislocations, phase diagrams, alloying, phase transformations, strengthening mechanisms, heat treatment, and solidification in metal systems. Processing and properties of plain carbon steels. Overview of forming and joining methods. Prerequisites: CEMS 214/235/251 or MECH 241/244/320.

CEMS 342 - Thermal and Mechanical Properties 3 hours. An introduction to the thermal and mechanical behavior of materials, including ceramics, glasses, metals, and polymers. Properties considered include strength, elastic modulus, hardness, toughness, thermal stresses, heat capacity and enthalpy, thermal conductivity, and thermal expansion. Discussion includes the effects of atomic, crystallographic, and microstructural characteristics of materials. Prerequisites: CEMS 214, 235 and 237.

CEMS 344 - Electrical, Magnetic, and Optical Properties 3 hours. Introduction to electronic and electrical properties of materials (metals, semiconductors, ceramics and polymers). Topics include band theory, semiconductor, ionic conductivity, polarization, dielectrics, optical absorption, and magnetism. Fundamental electronic properties of solids are stressed. Prerequisites: PHYS 126, MATH 271, CEMS 237.
CEMS 347 - Spectroscopy 2 hours. This course, which includes a laboratory, introduces spectroscopic techniques used to characterize atomic structure of materials. Prerequisite: CEMS 214.

CEMS 349 - X-ray Characterization 2 hours. This course, which includes a laboratory, introduces x-ray techniques used to characterize materials. Prerequisite: CEMS 214. Co-requisite: CEMS 342 or CEMS 344.

CEMS 352 - Electroceramics 3 hours. A survey of ceramics that are used for their electrical, magnetic, optical and piezoelectric functions including discussion of their design, composition, critical properties, processing techniques and applications. Categories include insulators, ceramic superconductors, capacitors, resistors, gas sensors, thermistors, varistors, piezoelectric, magnetic and electro-optic ceramics. Prerequisite: PHYS 126, CEMS 214.

CEMS 368 - Introduction to Bioengineering 3 hours. Biomedical engineering combines advances in engineering, biology and medicine to improve human health. It is, by necessity, cross-disciplinary. This course surveys and integrates selected aspects of engineering, biomedical, and clinical sciences to provide students with a global perspective of the field. Offered Fall semesters only. Prerequisites: CEMS 214 and BIOL 252 or permission of the instructor.

CEMS 372 - Kiln and Automatic Control 3 hours. This course discusses the systems and hardware used in the design and operation of both electric and combustion kilns. Emphasis is also placed on the design of temperature sensors and automatic control systems. Practical applications and troubleshooting are discussed and demonstrated in detail. Prerequisite: CEMS 221 or ELEC 220.

CEMS 400 - Special Topics 2-4 hours. This course covers topics which are not ordinarily covered in detail in the general curriculum, but are either current areas of faculty research or areas of current or future industrial interest.

CEMS 411 - Science of Whitewares 3 hours. The science and technology of whitewares (i.e., primarily stonewares and porcelains) covering mineralogy, raw material characterization, mixing, rheology and plasticity, forming processes, drying, firing, phase equilibria, thermal stress evolution, microstructural characterization, physical properties, and glazing. This course provides students with a fundamental basis for analyzing problems encountered in whitewares production so that general knowledge can be used to solve specific problems. Prerequisites: CEMS 107 203, 314.

CEMS 420 - Optical Glasses 3 hours. A detailed discussion of the primary glasses used in optical applications. Approximately one-half of the course will focus on pure and doped vitreous silica. The remainder of the course will deal with glasses containing rare-earth ions, infrared transmitting glasses, and traditional optical glasses. The production, structure, and general properties of each type of glass will be discussed in detail. The optical application of each glass will be stressed throughout the course. Prerequisite: CEMS 322.

CEMS 422 - Thermal Behavior of Glasses 2 hours. Prerequisite: CEMS 322.

CEMS 424 - Introduction to Photonics 3 hours. This course introduces the field of photonics, which can be defined as the creation, manipulation and detection of light for signal carrying capacity, in other words photonics is to light, what electronics is to electricity.
Students learn about waveguides, both planar and fiber optic, lasers, semiconductor devices (Lasers, LED's, diodes, etc.) and nonlinear optics. The materials processing aspects of these devices are emphasized, and the accumulation of devices and operations for communication systems computing and integrated optics are outlined. Prerequisite: CEMS 344.

CEMS 425 - Optical Spectra of Solids 2 hours. This course provides an introduction to the optical spectra of solids. Materials discussed will include crystalline and amorphous ceramics, metals, semi-conductors, and polymers. The course will consider the primary optical phenomena that occur between the ultraviolet and infrared edges. A number of applications of optical materials that are based on their optical spectra will be discussed, including lasers, phosphors, solar cells, infrared windows, optical sensors, and photochromic/electrochromic materials.

CEMS 426 - Advanced Glass Science 3 hours. This course covers advanced topics in glass and related fields which are not ordinarily covered in the general curriculum, but are either current areas of faculty research interest or areas of current or anticipated industrial or academic interest. Examples of possible topics include, but are not limited to, rare elements in glasses, non-silicate oxide glasses, halides in glasses, chalcogenide glasses, sol-gel processing, specialized experimental methods, such as neutron and or x-ray diffraction spectra, characterization of glasses, biological applications of glass, glass-ceramics, computer modeling of glass structure, natural glasses, and other topics which correspond to interests of the students and faculty. This course may occasionally be taught by visiting faculty in areas of their specialization. Readings from the literature will normally be a significant component of this course. Prerequisite: CEMS 322.

CEMS 428 - Fundamentals of Optical Behavior 2 hours. This course provides an introduction to the principles of basic optical phenomena in solids, particularly those based on the existence of a refractive index. Topics covered will include specular and diffuse reflection, refraction, birefringence, scattering, dispersion, and linear and circular polarization of light by interaction with solids. The effect of composition, temperature, and pressure/stress on the refractive index of solids will be discussed. Basic optical behavior of lenses, including lens defects, mirrors, and prisms will be introduced. Several applications of transparent optical materials will be covered, including non-linear optical materials, antireflection films, dielectric mirrors, and the origin of rainbows. Prerequisite: PHYS 126.

CEMS 434 - Polymer Characterization 3 hours. An introduction to the scientific principles of synthesis, processing, characterization, and testing of polymeric materials. Relationship of polymer properties and performance to the underlying structure and synthetic conditions is emphasized by application of appropriate scientific approaches. Hands-on experience with structure-property characterization of polymeric materials is included in the required laboratory. Prerequisite: CEMS 334 or CHEM 310.

CEMS 436 - Physical Metallurgy II 3 hours. Structure/processing/property relationships for metals with an emphasis on mechanical properties. Mechanical testing techniques and the effect of test temperature and strain rate on properties. Failure analysis, corrosion, fracture, fatigue, and creep. Brief introduction to the physical metallurgy of aluminum, titanium, magnesium and stainless steel alloys. Laboratory experiments emphasizing mechanical testing, heat treatment and microstructural development. Prerequisite: CEMS 336.

CEMS 438 - Nano-Technology 3 hours.
CEMS 445 - Mechanics of Ceramics 3 hours. Mechanics of deformable bodies with applications in the design of beams, columns, plates, shafts, and membranes. Kinetic and energy methods. Failure theories. Examples of mechanical design using ceramic materials are presented: refractories, electroceramics, and bioceramics. Prerequisite: CEMS 251 or MECH 241.

CEMS 446 - Composite Design and Fabrication 3 hours. The influence of materials, design and processing on composite properties is investigated. Discussions include details concerning state-of-the-art fabrication technology and performance of continuous-fiber-reinforced composites. Reviews of the open literature are presented concisely in order to understand and identify approaches toward addressing composite materials limitations. Prerequisites: (CEMS 251 or MECH 241), CEMS 214.

CEMS 450 - Independent Study 1-3 hours. Self-directed study. Prerequisite: Senior standing and approval of topic by faculty advisor and Dean's Office. Completed Plan of Study and permission of instructor required before registering for independent study.

CEMS 454 - Boundary Phenomena in Electronic Ceramics 3 hours. This course focuses on grain boundary phenomena in electronic ceramics. The first part of the course covers topics such as thermodynamics, composition, structure, formation and characterization of interfaces (grain boundaries). Relevant topics in solid-state and liquid-phase-assisted sintering are covered. The second part of the course focuses on the electrical properties of grain boundaries. Important electronic and dielectric phenomena associated with semiconductors, dielectrics and ferroelectrics are reviewed. Electrical character of junctions (p-n, Ohmic contacts, Schottky barriers) are also discussed. These concepts will be extended to grain boundaries to explain the behavior of grain-boundary-controlled electronic ceramics such as PTCR thermistors, IBL capacitors and ZnO varistors. Prerequisites: PHYS 126, CEMS 237, 344.

CEMS 456 - Ferroelectric Materials and Devices 3 hours. The course starts with a basic discussion of polarization in a dielectric, reviews electrostatic boundary conditions and then develops the concept of domains with the occurrence of spontaneous polarization. Domain reorientation is shown to develop anisotropic properties and frequency effects in the dielectric constant. The structural transitions are modeled with thermodynamic theory and soft mode concepts. The second part of the course is concerned with the effect of the symmetry of spontaneous polarization on the structure and properties. The properties are expanded into devices and the use of ferroelectric material as piezoelectrics, pyroelectrics, electrooptics, and dielectrics.

CEMS 458 - Materials for Electronic Packaging 3 hours. Electronic package systems for information processing include the function of electrical interconnection, cooling and physical support for the sets of semiconductor I.C. chips plus other components in electronic systems. Semiconductors, ceramics, polymers and metals are generally used in combinations in all packages; and, hence, it is necessary to understand their bulk properties as well as their interface structures and characteristics. This course focuses on the design of materials and processing needs for packaging technology from chip to board using principles involved in key areas of materials science and engineering disciplines. Basic properties and processing methods used in the design and fabrication of semiconductor IC's, ceramic substrates, metal interconnections, and polymers are discussed. Prerequisites: CEMS 314, 344.
CEMS 464 - Statistical Foundations for Manufacturing 3 hours. Following a review and extension of ANOVA and regression, experimental design is introduced as an extension of statistical methods. Various standard designs and their analysis are introduced and applied to research and quality control situations. Factorials, fractional factorials, response surface designs, and mixture designs are covered. Statistical process control, control charts, and optimization are introduced. Computer methods will involve some standard packages such as SPSS, Mini Tab, or IMSL on the mainframe, or software packages on computers in the College micro-computer labs. Prerequisites: ENGR 305 or MATH 241.

CEMS 468 - Biomedical Materials 3 hours. A survey of ceramic, metal and polymer materials and devices for repair and replacement parts in the human body. Emphasis is on the nature of the materials, the design and fabrication of devices, properties, applications and the problems of introducing foreign materials into the biosystem. Prerequisites: CEMS 214 and 251.

CEMS 469 - Methods In Biomedical Materials Engineering 3 hours. In this course students will design and fabricate a material for a bioengineering application. Significant emphasis will be placed on use of the principles taught in CEMS 468. Students will work in teams using an inquiry-based format. Significant emphasis is placed on a term report that includes the research plan (developed earlier in the semester). In addition, the term report will demonstrate an understanding of the testing, requirements and issues related to medical devices, a brief review of current and historic materials used for this bioengineering application (unless the application is novel), and a general understanding of current FDA guidelines for medical devices. Prerequisite CEMS 468. (Spring)

CEMS 480 - Thesis 2 hours. An independent research project carried out under the supervision of a faculty member. Senior standing required.

CEMS 481 - Thesis 2 hours. An independent research project carried out under the supervision of a faculty member. Senior Standing required.

CEMS 484 - Engineering Operations 4 hours. This course helps students understand the engineering and business aspects of a glass and ceramic manufacturing facility with an overview of large scale manufacturing processes of glass/ceramic products. Major topics covered are: quality control, plant layouts and the use of charts, the economics of manufacturing including cost estimation, cost accounting, depreciation, cash flow, tax consequences and rate of return analysis. Significant emphasis is placed on a term report covering set-up of business plans for a hypothetical glass or ceramic product. A visit to at least one glass or ceramic manufacturing plant is required. Senior standing required.

Electrical Engineering
ELEC 210 - Digital Logic 4 hours. Number systems, conversion, module-N arithmetic and digital coding techniques. Boolean algebra and minimization techniques. Combinational and sequential logic design; registers and counters; memory and programmable logic devices.

ELEC 220 - Circuit Theory 4 hours. Voltage and current laws, voltage and current sources, resistor, capacitor, and inductor. Series and parallel circuits, equivalent circuits, mesh and node equations, sinusoidal response, electric power and energy. Prerequisite: PHYS 126; pre- or co-requisite: MATH 271.
ELEC 303 - Software Engineering 4 hours. Software engineering concepts and techniques, structured design and modular construction, fundamentals of programming style; high level language programming, error detection and error location techniques. Prerequisite: ENGR 103.


ELEC 320 - Circuit Theory II 4 hours. First order and second order circuits, natural and forced response, step response, passive and active filters, transformers, dependent sources (modeling, biasing, and gain calculation), Fourier series, Fourier series analysis. Prerequisite: ELEC 220.

ELEC 322 - Signals and Systems 3 hours. Signal and system modeling concepts, system analysis in time domain, Fourier series and transform, Laplace transform, state variable techniques, z-transform, analysis and design of digital filters, FFT and applications. Prerequisite: ELEC 220.


ELEC 356 - Electronic Circuits 4 hours. Analysis and design of small signal and large signal electronic amplifiers. Frequency response, feedback, operational amplifiers. Prerequisite: ELEC 354.

ELEC 400 - Topics in Electrical Engineering 2-4 hours. Special topics in electrical engineering which vary from year to year. Prerequisite: Permission of instructor. (Sufficient demand)

ELEC 410 - Computer Architecture 3 hours. The main objectives of this course are gaining familiarity with fundamentals of architecture and learning how to apply cost-performance. Topics include instruction set principles, advanced pipelining, multi-cycle instructions, dynamic scheduling, instruction-level parallelism, and high-performance memory hierarchies. Different computer design options are discussed. Students learn the issues and tradeoffs involved in the design of modern processors. In particular, pipelining and memory management/access are stressed. Prerequisite: ELEC 310.

ELEC 420 - Communication Systems Engineering 3 hours. Analog and digital communication systems, modulation principles, multiplexing techniques and data transmission are among the topics covered. Prerequisite: ELEC 320.

ELEC 422 - Control Systems 3 hours. Linear feedback control system modeling analysis, and compensation techniques. Prerequisite: ELEC 322.

ELEC 424 - Digital Control Systems 3 hours. Discrete time systems and the z-transform, sampling and stability analysis techniques, digital controller design, microcomputer implementation of digital systems, quantization and round off noise analysis. Prerequisite: ELEC 422.
ELEC 442 - Applied Electromagnetism 3 hours. Complex vectors, Maxwell's equations, uniform plane waves, reflection and transmission of waves, waveguides and resonators, transmission lines, antennas, special topics in waves, electrostatic fields, electric force and energy, special techniques to solve electromagnetic equations, direct currents, magnetostatic fields, magnetic circuits, electroquasistatic fields, magnetoquasistatic fields, examples of applications. Prerequisites: PHYS 126, MATH 271.

ELEC 444 - Optical Fiber Communication Systems 3 hours. Basic optical fiber communication components including optical fibers, optical transmitters, and optical receivers; basic concept of analog and digital signals, channel multiplexing, and modulation; geometrical-optics description, wave propagation, dispersion, and fiber loss; system design and performance.

ELEC 450 - Independent Study 1-3 hours. Self-directed study. Prerequisite: Senior standing and approval of topic by faculty advisor and Dean's Office. Completed Plan of Study and permission of instructor required before registering for independent study.

ELEC 452 - Superconducting Electronics 3 hours. Metals, alloys and ceramics in the superconducting state: London, Ginzburg-Landau and BCS theories; High Tc superconductor theories such as Anderson's RVB model, types I and II, and high Tc superconductors. Applications in power generation and transmission, computers, magnetic field control systems, Josephson junctions, SQUID. Prerequisite: PHYS 126.

ELEC 466 - Fuzzy Logic 3 hours. The main objective of the course is to introduce the notion of approximate reasoning and its applications in solution of engineering problems. The general rules of logic and implication, computational aspects of fuzzy inference, and the mathematics of process are discussed. The course also includes a design project. Fuzzy logic is a project-based course. Prerequisites: ELEC 303, MATH 271.

ELEC 468 - Electric Machinery 3 hours. Magnetic theory and circuits, balanced polyphase circuits, and fundamentals of electromechanical energy conversion. Phasors, per-unit notation, transformers, three-phase and single-phase induction motors, synchronous, direct current and specialized machines. Prerequisite: ELEC 220.

ELEC 469 - Expert Systems 3 hours. Expert Systems is a project-based course that explores the application of artificial intelligence concepts to real life engineering problems. The course is primarily intended for students with have completed at least one of ELEC 466 or ELEC 474. Topics of discussion and techniques to explore include rule-based systems, modern control schemes, knowledge growth, and machine learning. Prerequisite: ELEC 466 or 468.

ELEC 472 - Image Processing 3 hours. An introductory course containing both optical and digital image processing. Contents include: partial coherence and optical transform, optical signal processing, spatial light modulators and detectors, image plane, impulse functions, fourier transform, convolution, restoration, projection-slice, tomography, compression, basics of pattern recognition. Prerequisites: PHYS 126, MATH 271.
ELEC 474 - Genetic Algorithms 3 hours. Genetic Algorithms, GA, are search and optimization techniques that function according to the evolutionary processes. GA is a member of AI family. A number of modern search and optimization techniques, including simple GA and classifier systems are introduced. The main objectives of the course are to gain a foundational understanding of GA and to become familiar with the mechanics of the process. Genetic Algorithms is a project-based course. Prerequisites: ELEC 303, MATH 271.


ELEC 478 - Electric Power Systems 3 hours. The history of power in electric utilities and industry, discussing present and future trends. Introduction to computer programming/modeling techniques currently used in power system engineering. Phasors, complex power, matrix operations, symmetrical components, power transformers, power transmission lines, power flows, faults, power system controls and transients. Field trips to industry. Prerequisite: ELEC 320.


ELEC 486 - VLSI Design 3 hours. Design of VLSI circuits concentrating on CMOS technologies. Logic design, fabrication principles, CAD layout and introduction to VLSI systems architecture. Structured design emphasis will be with the concept of hierarchy. Design methodology will focus on design of VLSI subsystems using advanced hierarchical design tools including Verilog HDL. This will be in the form of class homework and short projects. Prerequisite: ELEC 210.


ELEC 490 - Engineering Design Methods 2 hours. The purpose of design is to convert resources into devices, systems, processes and products to meet human needs. Detailed analysis and application of the design problem solving process from problem identification to implementation. Value engineering and other innovation processes are introduced. Prerequisite: Senior standing.

ELEC 496 - Senior Design Project 4 hours. Individual design project with a faculty advisor. Conception, design, construction and testing of an original project. Complete report required. Prerequisite: ELEC 490.

Engineering
ENGR 101 - Introduction to Engineering 2 hours. Answers questions about engineering covering such areas as branches of engineering, engineering report writing, professional liability, ethics and responsibility, the library, problem solving techniques. The concepts of teamwork and the engineering design process are presented through a required design project.
ENGR 102 - Computer Aided Design 2 hours. Computer aided design (CAD) is introduced, using the professional software. Students develop the ability to draw and design in two dimensions, to visualize these drawings in three dimensions, and to communicate with others using drawings.

ENGR 103 - Software Engineering 2 hours. An introduction to software engineering concepts using the C programming language. The majority of the course is concerned with learning proper programming techniques, including structured programming, top-down programming, modular techniques, loops and subroutines.

ENGR 104 - Computer Aided Engineering 2 hours. An introduction to engineering computations using the Matlab software package. Interactive numeric computations, data analysis, graphing are presented with engineering applications. Matrix, vector, and scalar computations are covered. Elementary math functions, trigonometric and hyperbolic functions, and complex numbers are used. Techniques for solution of linear systems of equations, interpolation and curve fitting, roots of polynomials, and numerical integration and differentiation are presented.

ENGR 110 - Technical Communications 4 hours. Technical communication is the delivery of information in an organized manner. This course will examine tools, resources, and design methods used to create technical documents. The course is designed for students who have solid grammar, spelling, and punctuation skills. Prerequisite: ENGL 101 or equivalent.

ENGR 160 - Freshman Seminar 0 hours. A series of lectures each semester for first year engineering students on topics of importance to engineers. Attendance mandatory.

ENGR 206 - Engineering Economy 3 hours. The analysis and evaluation of alternative uses of capital in engineering and business projects. Financial decision-making for engineering and management alternatives involving investment, operating cost and time value of money. Prerequisite: MATH 152.

ENGR 305 - Engineering Statistics 3 hours. Statistics as a tool in scientific and engineering applications. Topics include design of experiments, hypothesis testing, analysis of variance, regression analysis, statistical quality control, Bayesian decision-making and industrial applications and design. Prerequisite: MATH 152.

ENGR 360 - Undergraduate Seminar 0 hours. A series of lectures each semester for sophomore, junior, and senior engineering students on topics of importance to engineers. Attendance mandatory.


Mechanical Engineering
MECH 211 - Statics 3 hours. Two and three-dimensional force systems, the concept of equilibrium, analysis of trusses and frames, centroids, bending moment and shear diagrams, friction. Prerequisites: PHYS 125, MATH 152.
MECH 212 - Dynamics 3 hours. Rectilinear and curvilinear motion, translation and rotation, momentum and impulse principles, and work-energy relationships. Prerequisites: PHYS 125, MATH 253.

MECH 241 - Mechanics of Materials I 3 hours. The mechanics of solid deformable bodies, members subjected to tension, compression, flexure and torsion. Beam topics, stability of columns, combined stresses and strains. Prerequisite: MECH 211.

MECH 320 - Thermodynamics I 3 hours. Thermodynamic properties of gases, vapors and liquids. Laws of thermodynamics, energy and availability analysis. Prerequisites: MATH 253, PHYS 125.

MECH 321 - Thermodynamics II 3 hours. Applications of thermodynamic principles to the analysis of energy systems including power and refrigeration cycles. Mixtures and solutions, chemical reactions and equilibrium. Prerequisite: MECH 320.

MECH 324 - Fluid Mechanics I 3 hours. Principles of mechanics and thermodynamics applied to fluids at rest or in motion. Compressible and incompressible flow, viscous and non-viscous flows, boundary layers, pipe flow, dimensional analysis. Prerequisites: MECH 212, MATH 253.


MECH 327 - Thermal Sciences Laboratory 2 hours. Experiments are conducted to illustrate aspects of fluid mechanics, thermodynamics, and heat transfer. Concurrent Registration: MECH 321. Prerequisites: MECH 320, 324, 326; or CEMS 235, 332.

MECH 343 - Mechanics of Materials Laboratory 2 hours. Experiments designed to illustrate the principles of mechanics of materials and the methods of experimental mechanics. Prerequisites: MECH 211, MECH 241, MATH 271.

MECH 362 - Kinematics and Dynamics of Machinery 3 hours. Analysis and synthesis of mechanisms. Applications to reciprocating engines, cams, gears, flywheels, balancing, critical speeds, torsional vibration. Prerequisite: MECH 212.

MECH 364 - Machine Design 3 hours. Analysis, synthesis and design of machine elements and systems. Development of engineering judgment, stress and failure analysis, design for finite and infinite life. Corrosion, wear, lubrication, springs, and bolts. Prerequisites: (MECH 241 or CEMS 251), MECH 362.

MECH 400 - Topics in Mechanical Engineering 2-4 hours. Special topics in mechanical engineering which vary from year to year. Prerequisite: Permission of instructor. (Sufficient demand)

MECH 415 - Mechanical Vibrations I 3 hours. Harmonic oscillator; response of damped linear systems; multi-degree of freedom systems; introduction to vibrations of continuous systems. Prerequisites: MATH 271.
MECH 416 - *Mechanical Vibrations II* 3 hours. A continuation of MECH 415 focusing on multi-degree of freedom and continuous systems as well as advanced dynamics concepts such as Hamilton's Principle, Variational Calculus, and Lagrange's equation. Computer solution techniques are emphasized via solutions to the eigenvalue problems and finite element method. Prerequisites: MECH 212, 415, MATH 271.

MECH 417 - *Introduction to Finite Element Analysis* 3 hours. Use of the finite element method to solve problems in the areas of stress analysis, heat conduction, and fluid flow. Weighted residual and variational approaches, shape functions, numerical integration, and the patch test. Prerequisites: (CEMS 251 or MECH 241), MATH 271.

MECH 418 - *Finite Element Analysis II* 3 hours. Three-dimensional element formulation, tensor transformation, non-linear analysis, global-local analysis, multi-physics analysis, micro mechanics. Prerequisite: MECH 417.

MECH 424 - *Fluid Mechanics II* 3 hours. Advanced topics in fluid mechanics: compressible flows, boundary layers, potential flow, turbomachinery. Prerequisites: MECH 320, 324, MATH 271.


MECH 434 - *Heating, Ventilation, and Air Conditioning* 3 hours. Applied engineering thermodynamics; psychometrics; humidification and dehumidification processes; air cooling processes, heating processes; heat vapor transmission, fluid flow and pressure losses; air conveying and distribution. Prerequisite: MECH 321, (MECH 326 or CEMS 332).

MECH 441 - *Mechanics of Materials II* 3 hours. Beams on elastic foundations, curved bars, inelastic behavior, instability, introduction to thin plates and shells, introduction to elasticity, energy methods. Prerequisites: MECH 241, MATH 271.

MECH 448 - *Mechanics of Composite Materials* 3 hours. An introduction to composite materials with an emphasis on their selection, analysis, and use in modern engineering applications. Advantages and limitations of composite materials, basic concepts and characteristics. Stiffness and strength theories for uniaxial and multidirectional composite materials, with a macromechanical emphasis. Prerequisites: MECH 241, MECH 244 or CEMS 214, MATH 271.

MECH 450 - *Independent Study* 1-3 hours. Self-directed study. Prerequisite: Senior standing and approval of topic by faculty advisor and Dean's Office. Completed Plan of Study and permission of instructor required before registering for independent study.

MECH 454 - Multiscale Analysis for Deformation and Failure 3 hours. The goal of this course is to develop tools for students to analyze deformation and failure of engineering materials from multiscale points of view. By developing knowledge of micromechanics, meso-mechanics and macro-mechanics students will have a foundation to develop more understanding and useful skill for analysis of elasticity, inelasticity, fracture and fatigue of engineering materials. Prerequisites: (MECH 241 or CEMS 251) MATH 271.

MECH 466 - Manufacturing 3 hours. Analysis of manufacturing processes. Topics include casting, molding, forging, sheet-metal working, machining, joining, and many others. Plant tours are a required part of the course. Prerequisites: (MECH 244 or CEMS 214), ENGR 305.

MECH 486 - Modeling and Simulation of Dynamic Systems 3 hours. Mathematical modeling of physical systems and simulation of linear system responses. System response to varied inputs are studied using classical techniques. Laplace transforms and modeling and simulation software. Prerequisites: (MECH 326 or CEMS 332) and (ELEC 220 or CEMS 221).

MECH 495 - Senior Design Project I 3 hours. Individual and group comprehensive design projects employing basic and professional approaches to planning, organizing, judgmental and economic factors. Integrative aspects of creative design and analysis, interdisciplinary systems. Emphasis on technical communication skills. Prerequisite: Senior standing and permission of faculty.

MECH 496 - Senior Design Project II 3 hours. Continuation of MECH 495 and culmination in a comprehensive design report and developmental prototype, as required. Prerequisite: MECH 495.