

# GRAPHIC COMMUNICATION

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Department Chair: Colleen Twomey

## Academic Programs

Program name	Program type
Graphic Communication	BS, Minor

The Graphic Communication Department offers a curriculum leading to the Bachelor of Science degree, yet the discipline is both an art and a science. It appeals to students having an interest in creativity, science, technology, and management.

The Graphic Communication Department occupies approximately 33,000 square feet of laboratories in the Graphic Arts Building and in the adjacent specialty print and packaging prototyping building. Theory and practice are taught in modern classrooms incorporating the latest in teaching techniques. Fourteen well-equipped laboratories provide students with diverse experiences in the practical aspects of graphic media development and functional printing.

The Graphic Communication Department receives support from an advisory board comprised of industry leaders representing major graphic communication companies.

## Undergraduate Programs

### BS Graphic Communication

The field of graphic communication represents a large profession, one of the largest in the world. The profession embraces change, requiring those pursuing graphic communication careers to learn new and diverse skills. Graphic communication includes digital and conventional printing, publishing, packaging, digital imaging, computer graphics, digital design, digital photography, printable electronics, functional imaging, web and app development, user interface and user experience design, human-computer interaction design, and related areas. The discipline includes media and mass communication involving the creation, production, management, and distribution of advertising, marketing, websites, apps, books, magazines, newspapers, catalogs, packages, printed electronics, and other media in printed and digital form. Graduates are in high demand by leading national and international corporations in the graphic communication field.

The Bachelor of Science program in Graphic Communication is accredited by the Accreditation Council for Collegiate Graphic Communications, Inc. (ACCGC), an independent body dedicated to the improvement and recognition of collegiate level curricula in graphic communication.

Beyond acquiring a foundation in graphic communication, students select a specialization among the department's concentrations of design reproduction technology, web and digital media, graphic communication management, packaging graphics, and individualized study in graphic communication.

## Concentrations

BS Majors select one of the following concentrations based upon their interests and career goals.

### Design Reproduction Technology<sup>1</sup>

Emphasis on design and technology for print and web publishing. Coursework includes typography, branding, color theory, and design for packaging and for the publication of books, magazines, and web sites.

<sup>1</sup> The Graphic Communication Department's Design Reproduction Technology concentration focuses on the technical and electronic aspects of transforming design for reproduction in print and digital media. The concentration focuses on printing, web development, publishing, packaging, digital imaging, computer graphics, and related areas of mass media preparation and production. The Art and Design Department's Graphic Design concentration focuses on creative problem-solving and development of design and layout skills. The concentration leads to positions such as graphic designer, web designer, art director and creative director for advertising agencies, design studios and corporate design departments.

### Graphic Communication Management

A flexible program for students interested in management careers in the graphic communication industry. Concentration graduates enter careers focused on project management, marketing management, product development, account management, scheduling, estimating or other administrative roles. In addition to the major requirements in graphic communication, coursework includes multiple business management related disciplines. Graduates are in high demand throughout the country from publishing, design, printing, packaging, and web-based commerce firms, including their customers and suppliers.

### Graphics for Packaging

Designed for students who desire a career in the growing field of package graphics and printing. This program provides students with the opportunity to learn all components of graphic preparation for packaging, print reproduction and conversion, while also providing aspects of structural design and food safety. Consumer and industrial print packaging is addressed.

### User Experience/User Interface

Emphasis on the latest trends in interface development and the production and distribution of digital media. In addition to major requirements, coursework includes the study of user experience, visual design, and web and mobile interface design. The concentration leads to careers in user experience/user interface design, digital media production, product management, and opportunities with hardware and software manufacturers that service the graphic communication industry.

### Individualized Course of Study

An opportunity to pursue a course of study that meets a student's individual needs and interests.

## Graphic Communication Minor

A minor in Graphic Communication benefits students interested in pursuing careers in graphic communication or who anticipate using graphic communication skills in another career. Students in the minor have a competitive edge when applying for many jobs by understanding concepts, and gaining knowledge and skills in web and print media. Additionally, students develop an understanding of the effective design

and reproduction technologies, practical file preparation for various output processes including web and print media. In addition, students will gain an understanding of typography, digital photography, and color management. Information and application forms for this minor are available in the Graphic Communication Department office.

## Graduate Program

### MBA, Graphic Communication Document Systems Management Specialization

In cooperation with the Orfalea College of Business, a student can earn an MBA with a graphic communication emphasis in document systems management. This program is designed to prepare professionals having diverse backgrounds with a strong and advanced business orientation along with a grounding in graphic communication. For more information, see the Orfalea College of Business (<http://catalog.calpoly.edu/collegesandprograms/orfaleacollegeofbusiness/#graduatetext>) section.

### GRC Courses

#### GRC 101. Introduction to Graphic Communication. 3 units

Graphic communication history, theory, processes, applications, and practices. New technologies that affect day-to-day communication including traditional and digital printing and publishing, and non-print imaging including Internet applications. Overview of design technology, web and digital media, printing and imaging management, graphics for packaging, industry segments. 3 lectures.

#### GRC 102. Orientation to Graphic Communication. 2 units

Corequisite: GRC 101; Graphic Communication Majors and Minors only.

Orientation to Graphic Communication. Introduction to GRC curricula and applicable GRC resources that include advising, student success, and culture. Overview of laboratory fundamentals, laboratory safety, and acceptable practices for the operation and use of equipment. 2 lectures. Replaced GRC 172.

#### GRC 200. Special Problems for Undergraduates. 1-2 units

Prerequisite: Consent of instructor; Graphic Communication majors only.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

#### GRC 201. Digital Publishing Systems. 3 units

Prerequisite: Graphic Communication majors or Liberal Arts and Engineering majors with concentration in Publishing Technology.

Introduction to web, e-publishing, and print publishing systems including hardware, software, design considerations, and file formats. Overview of print output technologies, networking, web design, and digital publishing standards. 2 lectures, 1 laboratory.

#### GRC 203. Digital File Preparation and Workflow. 4 units

Prerequisite: GRC 101; GRC 201, and Graphic Communication major.

Terminology and techniques used in the creation of digital files and workflow systems for print and web. Workflow options including automation, proofing, and output systems will be discussed in addition to digital file delivery and transfer. 3 lectures, 1 laboratory.

#### GRC 204. Introduction to Contemporary Print Management and Manufacturing. 4 units

Prerequisite: GRC 101; Graphic Communication majors only.

Survey of management fundamentals and components relevant to graphic communication manufacturing, production, operations, and quality. Introduction to management theory and contemporary management trends and practices in the graphic communication industry. Course may be offered in classroom-based or online format. 4 lectures.

#### GRC 211. Materials for Graphic Communication Applications. 4 units

Prerequisite: Graphic Communication majors or Liberal Arts and Engineering majors with concentration in Publishing Technology.

Technical aspects of paper, other substrates, inks, toners, and other printable materials used in the printing and packaging industries. Manufacture, application and interaction of these materials in relation to particular processes and end use requirements. Hands-on testing of materials in relation to quality, properties, and performance. 3 lectures, 1 laboratory.

#### GRC 212. Materials for Graphic Communication Applications: Theory. 3 units

Prerequisite: Graphic Communication minors only.

Technical aspects of paper, other substrates, inks, toners and other printable materials used in the printing and packaging industries. Manufacture, application, and interaction of these materials in relation to particular processes and end use requirements. Credit not allowed for GRC majors. 3 lectures.

#### GRC 220. Introduction to Applied Social Media in Graphic Communication. 2 units

Prerequisite: GRC 101; major or minor in GRC.

Practical application of social media tools used in the Graphic Communication industry. Students prepare social media marketing campaigns that require research, design, writing, and elementary analytics. Total credit limited to 6 units. 2 lectures.

#### GRC 224. Binding and Finishing Processes. 1 unit

Prerequisite: GRC 211; Graphic Communication majors and minors only.

Imposition techniques, cutting, and folding. Stitch, case and perfect binding techniques and applications. Operational and aesthetic uses of die cutting, scoring, creasing, foil stamping and embossing techniques. 1 laboratory. Replaces GRC 324.

#### GRC 270. Selected Topics. 1-4 units

Prerequisite: Open to undergraduate students and consent of instructor; Graphic Communication majors only.

Directed group study of selected topics. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

#### GRC 301. Digital Photography and Color Management. 4 units

Prerequisite: GRC 203.

Digital photography for print and web, including lighting, exposure, composition, and photo retouching. Color measurement and the application of color management and quality assessment in the graphic communication industry. 3 lectures, 1 laboratory.

**GRC 316. Flexographic Printing Technology. 3 units**

Prerequisite: GRC 203; Graphic Communication majors only.

Flexographic printing technology for flexible packaging, label printing, folding and corrugated cartons. Optimization of file preparation, plate imaging, and equipment settings. Specification and management of automated workflows. 2 lectures, 1 laboratory.

**GRC 318. Digital Typography for Print and Web. 4 units**

Prerequisite: Junior standing; GRC 203; GRC 301.

Application of typography using current software tools for print, web and digital publishing. In-depth study of communication principles and visual organization. Font technology and management for the creative, print and web publishing industries. 3 lectures, 1 laboratory.

**GRC 320. Managing Quality in Graphic Communication. 4 units**

Prerequisite: GRC 328 and STAT 217; Graphic Communication majors only.

Theory and practices of quality management in the graphic communication industry. Quantifying customer expectations, specifications, standard operating procedures, SPC tools, and employee empowerment. Principles of Lean Management, Six Sigma, ISO, and Malcolm Baldrige. 3 lectures, 1 laboratory.

**GRC 322. Advanced Digital Typography. 3 units**

Prerequisite: GRC 318; Graphic Communication majors only.

Advanced typographic principles relating to print and electronic media. Page layout and font management with consideration for electronic media. Applied problems focusing on typographic design, typographic application and file preparation, including web typography and eBook creation. 2 lectures, 1 laboratory.

**GRC 328. Offset Printing Technology. 4 units**

Prerequisite: GRC 211 or GRC 212 and Graphic Communication majors only.

Offset printing and plate technology for commercial, publication, packaging and reprographic segments of the printing industry. Press configurations, materials, computerized press controls, workflow, pressroom management, coating and quality control. Folding structures, plate types, quality, and new technologies for offset printing. 3 lectures, 1 laboratory.

**GRC 329. Printed Electronics and Product Development. 3 units**

Prerequisite: GRC 328.

Introduction to printed electronics technologies. Incorporate printed and hybrid flexible electronics for tangible interactive functional and novelty applications, including smart packaging, interactive point-of-purchase displays, publications, and marketing materials through strategic designing, prototyping, and fabrication. 2 lectures, 1 laboratory.

**GRC 331. Color Management and Quality Analysis. 4 units**

Prerequisite: Completion of GE Area B1 (GE Area B3 for students on the 2019-20 or earlier catalogs); and ART 182 or GRC 301.

The physics, psychology, measurement, analysis and management of color for print and electronic documents, including web sites. Practical application of color correction, color proofing, and production workflows that ensure the best possible color reproduction. 3 lectures, 1 activity.

**GRC 337. Consumer Packaging. 4 units**

Prerequisite: GRC 301.

Strategies for package printing that integrate concepts from marketing/branding, design, and technology. Package manufacturing, function, quality, visual appeal, sustainability, and economics are addressed. 3 lectures, 1 laboratory.

**GRC 338. Web Development and Content Management. 4 units**

Prerequisite: GRC 318 or GRC 218.

Web development production techniques including creating, repurposing, and managing assets for web publishing. Digital content management for tablet and mobile device publishing. 3 lectures, 1 laboratory.

**GRC 339. Web Design and Production. 4 units**

Prerequisite: GRC 338; Graphic Communication majors only.

Advanced design and production techniques for web development. Current software applications and technologies for user interface design, site structure and information architecture. 3 lectures, 1 laboratory.

**GRC 347. Packaging Graphics Technology and Design. 3 units**

Prerequisite: GRC 318; GRC 337; Graphic Communication major or minor.

Advanced creative problem-solving strategies associated with the technologies used in designing graphics for packaging and output methods. Advanced techniques in graphic software including file hygiene, color management, and printing methods. Integrated packaging campaigns which include multiple substrates and digital shelf. Professional portfolio produced. Field trip may be required. 2 lectures, 1 laboratory.

**GRC 357. Specialty Printing Technologies. 3 units**

Prerequisite: GRC 301; Graphic Communication majors only.

Specialty printing and imaging technologies used in fabric decorating, decals for marketing, industrial, and functional printing, security printing and various forms of packaging. Printing on various materials using special processes including screen printing, pad printing, sublimation printing, digital imaging, and post print finishing. 2 lectures, 1 laboratory.

**GRC 361. Marketing and Sales Management for Print and Digital Media. 4 units**

Prerequisite: GRC 101 and GRC 204; Graphic Communication majors only.

Identification and development of target markets for products and services in the graphic communication industry. Deployment of strategies in pricing, promotion and distribution management. Application of customer relationship management techniques for personal selling, forecasting and planning. 3 lectures, 1 laboratory.

**GRC 372. Applied Graphic Communication Practices. 2 units**

Prerequisite: GRC 101; GRC 102 or GRC 172; Graphic Communication majors only.

Application of theories and practices to University Graphic Systems as they apply to commercial printing, publication printing, digital media and graphic communication industries. Major credit limited to 2 units; total credit limited to 12 units. 2 seminars.

**GRC 377. Web and Print Publishing. 4 units**

2020-21 or later: Upper-Div GE Area B

2019-20 or earlier catalog: GE Area B5, B6, or B7

Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; and completion of GE Areas B1 through B4, with a grade of C- or better in one course in GE Area B4 (GE Area B1 for students on the 2019-20 or earlier catalogs).

Web and print publishing technology and its impact on society. The technologies of digital photography, typography, graphics, layout, and design for print and web publishing including decision-making considerations. The application of scientific and mathematical principles to web and print publishing technologies. 3 lectures, 1 laboratory. Fulfills GE Area Upper-Division B (GE Areas B5, B6, or B7 for students on the 2019-20 catalog).

**GRC 400. Special Problems for Advanced Undergraduates. 1-2 units**

Prerequisite: Consent of instructor; Graphic Communication majors only.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 2 units per quarter.

**GRC 402. Digital Printing and Emerging Technologies in Graphic Communication. 3 units**

Prerequisite: Graphic Communication major; and GRC 318.

Study of the theory, technology, economics and application of digital printing processes and variable data publishing. Explores digital printing technology, databases, and database publishing techniques. 2 lectures, 1 laboratory.

**GRC 404. Data Management, Estimating and Visualization in Graphic Communication. 4 units**

Prerequisite: Junior standing and GRC 328; Graphic Communication majors only.

Cost estimating of graphic communication products and data services. Study of data sources and entity relationship design. Exploration, uses, analysis and visualization of data used in digital advertising, marketing, graphic communications operations and finance. Course may be offered in classroom-based or online format. 3 lectures, 1 laboratory. Formerly GRC 403.

**GRC 411. Strategic Trends and Profitability Issues in Print and Digital Media. 4 units**

Prerequisite: GRC 403 or GRC 404; and senior standing; Graphic Communication majors only.

Graphic communication industry market trends and strategic positioning. Strategies for successfully positioning a business. Paradigms and business practices for graphic communication companies. Company analysis using case studies. Innovative management practices in the graphic communication industry. 3 lectures, 1 activity.

**GRC 420. Graphic Communication in Integrated Marketing Communications. 4 units**

Prerequisite: Senior standing; JOUR 331; JOUR 342; BUS 453; and one of the following: GRC 338, GRC 377, or JOUR 390.

Working with clients, participants will organize and demonstrate proficiency in the use of applicable Graphic Communication design, workflow and data-driven communication software and digital printing technologies using print and media software. GRC capstone for the Integrated Marketing Communications minor. 3 lectures, 1 laboratory.

**GRC 421. Production Management for Print and Digital Media. 4 units**

Prerequisite: GRC 320; Graphic Communication majors only.

Application of management principles and production control methodologies for print and digitally-imaged products. Organization and financial analysis, decision-making, equipment and inventory planning, resource optimization, and the application of practiced and newly innovative contemporary world-class techniques for improving profitability in the graphic communication industry. 3 lectures, 1 activity.

**GRC 422. Human Resource Management Issues for Print and Digital Media. 4 units**

Prerequisite: GRC 403 or GRC 404; and senior standing; Graphic Communication majors only.

Human resource management integrated into the success of graphic communication companies. A comprehensive management approach is utilized emphasizing employee development, training, promotion, and motivation. Conflict management, facilitation skills, team building empowerment, leadership, ethical and legal issues in the graphic communication industry. 3 lectures, 1 laboratory.

**GRC 429. Mobile User Experience. 3 units**

Prerequisite: GRC 338; Graphic Communication majors only.

Current technologies and production tools used for mobile user interface and experience design, and prototyping. Industry standards, digital rights management, file formats, and publishing options for digital media applications. Legal, ethical, and business issues surrounding digital media. 2 lectures, 1 laboratory.

**GRC 433. User Experience Methods for Digital Innovation. 3 units**

Prerequisite: Completion of GE Area A with grades of C- or better; completion of GE Area C; Junior standing; or consent of instructor.

Fundamental practices associated with user experience design including information architecture, scenario creation and usability testing as it relates to prototypes and interactive content. Structure and presentation of information will be analyzed to employ the principles garnered from the analysis and techniques learned. 2 lectures, 1 laboratory.

**GRC 437. Advanced Consumer Packaging. 4 units**

Prerequisite: GRC 337; Graphic Communication major. Recommended: GRC 361.

Business processes associated with designing, selling packaging for consumer brands. 2D/3D software, user experience design, sustainability, prototyping, marketing, profitability, sales for global consumer product goods industry. 3 lectures, 1 laboratory.

**GRC 439. Book Design Technology. 4 units**

Prerequisite: Senior standing, GRC 402; Graphic Communication majors only.

Advanced creative problem-solving strategies associated with the technologies used in book design and production. Advanced techniques in page layout, design, typography, type specification and image manipulation as they relate to output technology. Content, format and distribution of print and electronic books. 3 lectures, 1 laboratory.

**GRC 440. Magazine Design Technology. 4 units**

Prerequisite: Senior standing, GRC 402; Graphic Communication majors only.

Concept development and design for magazines and publications. Technical considerations as they relate to output technology and digital publishing. Application of organizational structures such as grids, formatting and sequential design. Advanced techniques in typography and image manipulation. Distribution of content for print and digital formats. 3 lectures, 1 laboratory.

**GRC 451. Management Topics in Graphic Communication. 3 units**

Prerequisite: GRC 203; Graphic Communication majors and minors only.

Current trends and practices in select graphic communication management topics. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures.

**GRC 452. Emerging Technologies in Graphic Communication. 3 units**

Prerequisite: GRC 203.

Current trends and practices in select graphic communication emerging digital topics. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures.

**GRC 453. Design Reproduction Topics in Graphic Communication. 3 units**

Prerequisite: GRC 203.

Current trends and practices in select graphic communication design reproduction topics. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures.

**GRC 461. Senior Project - Independent Study. 1-3 units**

Prerequisite: Senior standing; Graphic communication major; completion of GWR; and STAT 217 and consent of instructor.

Students will engage in collaborative projects in other disciplines without the constraint of a single quarter schedule. Formal presentation and report required. Minimum 90 hours of time. Total credit limited to 3 units.

**GRC 462. Senior Project. 3 units**

Prerequisite: Senior standing; Graphic communication major; completion of GWR; and STAT 217 and consent of instructor.

Selection and completion of a culminating project. Projects typical of problems that graduates must solve in their fields of employment. Project results presented in formal report and presentation. 1 lecture, 2 activities.

**GRC 463. Senior Project - Applied Practices. 1-3 units**

Prerequisite: Senior standing; Graphic communication major; completion of GWR; and STAT 217 and consent of instructor.

Opportunities in individual or group-based projects in Graphic Communication competitions and/or sponsored projects. Formal presentation and report required. 30 hours per unit. Total credit limited to 3 units. 1-3 activities.

**GRC 470. Selected Advanced Topics. 1-4 units**

Prerequisite: GRC 101 and GRC 201 and Graphic Communication majors only.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

**GRC 471. Selected Advanced Laboratory. 1-4 units**

Prerequisite: Consent of instructor; Graphic Communication majors only.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

**GRC 485. Cooperative Education Experience. 6 units**

CR/NC

Prerequisite: Sophomore standing and consent of instructor; Graphic Communication majors only.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12 units. Credit/No Credit grading only.

**GRC 495. Cooperative Education Experience. 12 units**

CR/NC

Prerequisite: Sophomore standing and consent of instructor; Graphic Communication majors only.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12 units. Credit/No Credit grading only.

**GRC 500. Special Problems in Graphic Communication for Graduate Students. 2 units**

Prerequisite: Graduate standing and consent of instructor.

Investigation, research, studies of problems in the graphic communication industry. Repeated course over four quarters working with University Graphic Systems, the Graphic Communication Institute at Cal Poly, and with individual faculty. Total credit limited to 8 units.

**GRC 501. Survey of Functional Printing. 2 units**

Prerequisite: Consent of Printed Electronics and Functional Imaging Graduate Coordinator.

Foundations for emerging functional printing fields including printed electronics, active packaging, and security printing. Emphasis on processes, materials, electrical characterization, sensing, barrier properties, and anti-counterfeiting. Focus on applications including lighting, displays, novel electronics, energy harvesting, energy storage, sensors, scavengers, and brand security. Course offered online only. 2 lectures.

**GRC 502. Orientation to Functional Printing. 2 units**

Prerequisite: Consent of Printed Electronics and Functional Imaging Graduate Coordinator.

Orientation and laboratory exploration for printed electronics, active packaging, and security printing. Introduction to curricula, lab activities, research opportunities, and the use of equipment. Active participation in laboratory experiments related to processes and materials. 1 lecture, 1 laboratory.

**GRC 510. Materials for Functional Printing. 4 units**

Corequisite: GRC 501.

Study of functional materials including substrates, coatings, and inks. Focus on barrier and heat-stable substrates as well as conductive, semi-conductive, dielectric, transparent conductors, forensic, sensor, and other functional inks and coatings. Emphasis on rheology, morphology, sintering and annealing. Course offered online only. 4 lectures.

**GRC 512. Printing and Coating Technologies. 4 units**

Corequisite: GRC 501.

Study of functional printing and coating technologies, including screen printing, flexography, gravure, ink jet, offset, slot die, blade coating and conventional deposition techniques. Course offered online only. 4 lectures.

**GRC 514. Optical and Electrical Patterning. 4 units**

Corequisite: GRC 501.

Imaging technologies and processes for security, electronic, and active packaging printing. Focus on creating and evaluating images for applications in product security and electrical fabrication. Course offered online only. 4 lectures.

**GRC 520. Functional Printing Product and Business Development. 4 units**

Prerequisite: GRC 501.

Principles of business and product development for electronic and functional applications. Focus on intellectual property rights, capital funding, entrepreneurship, and management of a technology business. Course offered online only. 4 lectures.

**GRC 530. Functional Printing Workflows. 4 units**

Prerequisite: GRC 502.

Evaluation of advanced imaging technologies for functional printing applications. Imaging characteristics for ink/substrate combinations, focusing on print process attributes. Compensation for print characteristics. Enabling automated workflow technologies to improve throughput and minimize errors. 2 lectures, 2 laboratories.

**GRC 551. Current Trends in Printed Electronics. 4 units**

Corequisite: GRC 502.

Current trends and practices in select printed electronics topics. Open to graduate students. The Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory.

**GRC 552. Current Trends in Active Packaging. 4 units**

Corequisite: GRC 502.

Current trends and practices in select active packaging topics. Open to graduate students. The Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory.

**GRC 553. Current Trends in Security and Anti-Counterfeiting. 4 units**

Corequisite: GRC 502.

Current trends and practices in select security and anti-counterfeiting topics. Open to graduate students. The Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory.

**GRC 560. Research Methods in Printed Electronics and Functional Imaging. 2 units**

Corequisite: GRC 530.

Methods for conducting qualitative and quantitative evaluations, testing, and experimentation as well as writing investigative, scholarly research papers and theses in functional printing. Topics include qualitative research, descriptive research, experimental design, statistical analysis, writing styles, and publishing options. 1 lecture, 1 activity.

**GRC 595. Cooperative Education Experience. 4-12 units**

CR/NC

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 12 units. Credit/No Credit grading only.

**GRC 596. Research Project in Printed Electronics and Functional Imaging. 3 units**

Prerequisite: GRC 560.

Comprehensive research project in printed electronics and functional imaging. Communication of the results and findings of scholarly work in written report and by oral presentation.