Web and Mobile Systems – 3%
Domain Scope
1. Web-based applications including related software, databases, interfaces, and digital media
2. Mobile applications including related software, databases, interfaces, and digital media
3. Contemporary web technologies, social media.

Domain Competencies
A. Design a responsive web application utilizing a web framework and presentation technologies in support of a diverse online community. *(Web application development)*
B. Develop a mobile app that is usable, efficient, and secure on more than one device. *(Mobile app development)*
C. *Analyze a web or mobile system and correct security vulnerabilities. (Web and mobile security)*
D. Implement storage, transfer, and retrieval of digital media in a web application with appropriate file, database, or streaming formats. *(Digital media storage and transfer)*
E. Describe the major components of a web system and how they function together, including the web server, database, analytics, and front end. *(Web system infrastructure)*

Web and Mobile Systems Subdomains
01 Perspectives and impact
(Level 1 minimal degree of engagement)
Competencies:
   a. Describe how the world-wide web has impacted people's lives over time.
   b. Illustrate the growth and changes in mobile devices and applications over time.

02 Technologies
(Level 2 medium degree of engagement)
Competencies:
   a. Describe the role of HTTP and HTTPS in the context of web applications.
   b. Build a simple web site that
      · organizes information effectively,
      · uses valid HTML and CSS, and
      · applies appropriate web standards from standards bodies such as W3C.
   c. Develop a web or mobile application that
      · uses industry-standard technologies,
      · integrates serialized data in a structured format such as XML or JSON both synchronously and asynchronously,
      · validates data inputs on the client- and server-side as appropriate,
      · uses cookies,
      · reads or modifies data in a server-side database, and
      · uses JavaScript.
   d. Express the constraints involved in state management (cookies, query strings, sessions) in the web and mobile context.
   e. Contrast client-side with server-side security issues.

03 Digital media
(Level 2 medium degree of engagement)
Competencies:
   a. Compare characteristics such as color depth, compression, codec, and server requirements for
      · graphic media file formats and
      · streaming media formats.
   b. Propose a graphic file type for a given set of image characteristics.
   c. Provide metaphors for issues involved in deploying and serving media content.

04 Applications concepts
(Level 1 minimal degree of engagement)
Competencies:
   a. Express constraints that mobile platforms put on developers, including the performance vs. power tradeoff.
   b. Contrast mobile programming, web programming, and general-purpose programming.
   c. Apply principles of UXD to enhance the user experience of a web site or mobile application.
   d. Evaluate the design and architecture of a web or mobile system, including issues such as design patterns (including MVC), layers, tradeoffs between redundancy and scalability, state management, and search engine optimization.

05 Development tools and frameworks
(Level 1 minimal degree of engagement)
Competencies:
   a. aUse industry-standard tools and technologies for web and mobile development.
   b. Argue for the advantages and disadvantages of development frameworks for web and mobile development.
   c. Use a development framework such as jQuery, Angular, Laravel, ASP.NET MVC, Django, or WordPress.
   d. Use collaboration tools such as GitHub to work with a team on a web or mobile application.

06 Vulnerabilities
(Level 1 minimal degree of engagement)
Competencies:
   a. Illustrate browser security models including same-origin policy and thread models in web security.
   b. Describe how authentication, secure certificates, and secure communication can be used in web sessions.
   c. Instruct others on common types of vulnerabilities and attacks in web and mobile applications, such as
      · using web page graphics as web beacons,
      · using cookies to compromise privacy,
      · denial of service attacks,
      · cross-site scripting attacks, and
      · SQL injection attacks.
   d. Secure a web or mobile application and defend against common attacks using techniques such as
      · client-side security capabilities,
      · public key encryption,
      · security certificates, and
      · safely persisting user logins (such as "remember me" functionality).
   e. Use accepted standards to ensure that user input on web pages does not affect server-side processes.

07 Social software
(Level 1 minimal degree of engagement)
Competencies:
   a. Illustrate the difference between asynchronous and synchronous communication on the web.
   b. Contrast the characteristics of various web- and mobile-based communication media.

Note: Level L1 (L1) used within a subdomain indicates a minimal degree of engagement associated with the learning proficiency of the fundamentals of the subdomain.

Levels 2 (L2) and 3 (L3) used within a subdomain indicate medium and large degrees of learning engagement associated with the application and transferring of learning to complex problems and situations.