The Information Technology Body of Knowledge

ITF. Information Technology Fundamentals (25 core hours)
  ITF. Pervasive Themes in IT (17)
  ITF. History of Information Technology (3)
  ITF. IT and Its Related and Informing Disciplines (3)
  ITF. Application Domains (2)

HCI. Human Computer Interaction (20 core hours)
  HCI. Human Factors (6)
  HCI. HCI Aspects of Application Domains (3)
  HCI. Human-Centered Evaluation (3)
  HCI. Developing Effective Interfaces (3)
  HCI. Accessibility (2)
  HCI. Emerging Technologies (2)
  HCI. Human-Centered Computing (1)

IAS. Information Assurance and Security (23 core hours)
  IAS. Fundamental Aspects (3)
  IAS. Security Mechanisms (Countermeasures) (5)
  IAS. Operational Issues (3)
  IAS. Policy (3)
  IAS. Attacks (2)
  IAS. Security Domains (2)
  IAS. Forensics (1)
  IAS. Information States (1)
  IAS. Security Services (1)
  IAS. Threat Analysis Model (1)
  IAS. Vulnerabilities (1)

IM. Information Management (34 core hours)
  IM. IM Concepts and Fundamentals (8)
  IM. Database Query Languages (9)
  IM. Data Organization Architecture (7)
  IM. Data Modeling (6)
  IM. Managing the Database Environment (3)
  IM. Special-Purpose Databases (1)

IPT. Integrative Programming & Technologies (23 core hours)
  IPT. Intersystems Communications (5)
  IPT. Data Mapping and Exchange (4)
  IPT. Integrative Coding (4)
  IPT. Scripting Techniques (4)
  IPT. Software Security Practices (4)
  IPT. Miscellaneous Issues (1)
  IPT. Overview of Programming Languages (1)

MS. Math and Statistics for IT (38 core hours)
  MS. Basic Logic (10)
  MS. Discrete Probability (6)
  MS. Functions, Relations and Sets (6)
  MS. Hypothesis Testing (5)
  MS. Sampling and Descriptive Statistics (5)
  MS. Graphs and Trees (4)
  MS. Application of Math & Statistics to IT (2)

NET. Networking (22 core hours)
  NET. Foundations of Networking (3)
  NET. Routing and Switching (8)
  NET. Physical Layer (6)
  NET. Security (2)
  NET. Network Management (2)
  NET. Application Areas (1)

PF. Programming Fundamentals (38 core hours)
  PF. Fundamental Data Structures (10)
  PF. Fundamental Programming Constructs (10)
  PF. Object-Oriented Programming (9)
  PF. Algorithms and Problem-Solving (6)
  PF. Event-Driven Programming (3)

PT. Platform Technologies (14 core hours)
  PT. Operating Systems (10)
  PT. Architecture and Organization (3)
  PT. Computing Infrastructures (1)
  PT. Enterprise Deployment Software
  PT. Firmware
  PT. Hardware

SA. System Administration and Maintenance (11 core hours)
  SA. Operating Systems (4)
  SA. Applications (3)
  SA. Administrative Activities (2)
  SA. Administrative Domains (2)

SIA. System Integration and Architecture (21 core hours)
  SIA. Requirements (6)
  SIA. Acquisition and Sourcing (4)
  SIA. Integration and Deployment (3)
  SIA. Project Management (3)
  SIA. Testing and Quality Assurance (3)
  SIA. Organizational Context (1)
  SIA. Architecture (1)

SP. Social and Professional Issues (23 core hours)
  SP. Professional Communications (5)
  SP. Teamwork Concepts and Issues (5)
  SP. Social Context of Computing (3)
  SP. Intellectual Property (2)
  SP. Legal Issues in Computing (2)
  SP. Organizational Context (2)
  SP. Professional and Ethical Issues and Responsibilities (2)
  SP. History of Computing (1)
  SP. Privacy and Civil Liberties (1)

WS. Web Systems and Technologies (22 core hours)
  WS. Web Technologies (10)
  WS. Information Architecture (4)
  WS. Digital Media (3)
  WS. Web Development (3)
  WS. Vulnerabilities (2)
  WS. Social Software

Total Hours: 314

Notes:
1. Order of Knowledge Areas: Fundamentals first, then ordered alphabetically.
2. Order of Units under each Knowledge Area: fundamentals first (if present), then ordered by number of core hours.
IT Fundamentals (ITF) – 25 core hours
ITF. Pervasive Themes in IT
ITF. History of Information Technology
ITF. IT and Its Related and Informing Disciplines
ITF. Application Domains

This knowledge area is intended to be at the introductory level in a curriculum and to provide foundation skills for subsequent courses. It provides an overview of the discipline of IT, describes how it relates to other computing disciplines, and begins to instill an IT mindset. The goal is to help students understand the diverse contexts in which IT is used and the challenges inherent in the diffusion of innovative technology.

ITF. Pervasive Themes in IT
Minimum core coverage time: 17 hours

Topics:
User centeredness and advocacy
Information Assurance and Security
IT systems model
Management of complexity (abstraction, modeling, best practices, patterns, standards, and use of appropriate tools, including versioning and group collaboration tools)
Information and communication technologies
  Human-Computer Interaction
  Information Management
  Networking
  Platform Technologies
  Programming
  Web Systems and Technologies
Adaptability
Professionalism (life-long learning, professional development, ethics, responsibility)
Interpersonal skills
Data versus information

Core learning outcomes:
1. Explain how the components of an IT system interrelate.
2. Explain how and why complexity occurs in IT.
3. Manage complexity in an information technology environment by applying best practices and using appropriate technologies and methodologies.
4. Describe the role of the IT professional as the user advocate.
5. Explain why life-long learning and continued professional development is critical for an IT professional.
6. Explain why adaptability and interpersonal skills are important to an IT professional.
7. Explain the difference between a concept and the possible representations of that concept: for example, the relationship between information and data.
8. Illustrate the use of information and communication technologies to solve problems as an IT professional.
9. Explain why the IAS perspective needs to pervade all aspects of IT.
10. Explain how organizational context is influenced by and impacts the development and deployment of IT systems.
ITF. History of Information Technology

Minimum core coverage time: 3 hours

Topics:
- History of computing technology
- Social history of computing impacts
- Development of user interaction
- History of the Internet

Core learning outcomes:
1. Outline the history of computing technology, the Internet, and the World-Wide Web.
2. Explain how computing and society impact one another.

ITF. IT and Its Related and Informing Disciplines

Minimum core coverage time: 3 hours

Topics:
- Definition of IT
- Computer Science
- Software Engineering
- Information Systems
- Cognitive Science
- Computer Engineering
- Mathematics and Statistics
- Others such as Natural Sciences, Linguistics, Sociology, Psychology, etc.

Core learning outcomes:
1. Explain the relationship between IT and related and informing disciplines.

ITF. Application Domains

Minimum core coverage time: 2 hours

Topics:
- Bio-informatics & medical applications
- Business applications
- Law enforcement
- Political processes
- E-commerce
- Manufacturing
- Education
- Entertainment
- Agriculture
- Software development
- Others

Core learning outcomes:
1. Explain how and to what extent IT has changed various application domains.
2. Explain how IT has impacted the globalization of world economy, culture, political systems, health, security, warfare, etc.
Human Computer Interaction (HCI) – 20 core hours

HCI. Human Factors
HCI. HCI Aspects of Application Domains
HCI. Human-Centered Evaluation
HCI. Developing Effective Interfaces
HCI. Accessibility
HCI. Emerging Technologies
HCI. Human-Centered Computing

A key component to the discipline of Information Technology is the understanding and the advocacy of the user in the development of IT applications and systems. IT graduates must develop a mind-set that recognizes the importance of users and organizational contexts. They must employ user-centered methodologies in the development, evaluation, and deployment of IT applications and systems. This requires graduates to develop knowledge of HCI, including but not limited to such areas as user and task analysis, human factors, ergonomics, accessibility standards, and cognitive psychology.

HCI. Human Factors
Minimum core coverage time: 6 hours

Topics:
Cognitive principles – perception, memory, problem solving, etc.
Understanding the user
Designing for humans – affordances, conceptual models, feedback, constraints, mapping, stages of action, etc.
Ergonomics

Core learning outcomes:
1. Describe the relationship between the cognitive principles and their application to interfaces and products.
2. Explain the conceptual terms for analyzing human interaction with products such as affordance, conceptual model, and feedback.
3. Analyze different user populations with regard to their abilities and characteristics for using both software and hardware products.
4. Explain the importance of user abilities and characteristics in the usability of products.

Advanced learning outcomes:
1. Illustrate how cognitive principles are applied to product design.
2. Design a product for a specific user population.
3. Show how the physical aspects of product design impact its usability.
4. Distinguish between the various principles for designing for humans.
5. Classify the seven stages of action for a task scenario.

HCI. HCI Aspects of Application Domains
Minimum core coverage time: 3 hours

Topics:
Types of environments
Cognitive models
Approaches
Core learning outcomes:
1. Describe different types of interactive environments.
2. Describe the differences in developing user interfaces for different application environments (e.g., Web pages, standalone applications, etc.).
3. Describe several affordances of a Web environment that can enhance the usability of a Web-based application.
4. Explain the connection between the design of a user interface and a model of user domain expertise.
5. Match descriptions of cognitive models with the model names.

Advanced learning outcomes:
1. Develop user interfaces for domain specific applications.
2. Integrate domain experts’ knowledge into specific requirements for domain-specific user interfaces.
3. Apply cognitive models to the design of application user interfaces.

HCI. Human-Centered Evaluation
Minimum core coverage time: 3 hours

Topics:
- Heuristics
- Usability testing
- Usability standards – international, OS, accessibility

Core learning outcomes:
1. List the general principles used in the heuristic evaluation of a user interface design.
2. Perform a simple usability evaluation for an existing software application.
3. Classify usability performance and preference metrics: learning, task time, task completion, and user satisfaction.
4. Describe common usability guidelines and standards.

Advanced learning outcomes:
1. Measure the usability of an application by performing a heuristic evaluation.
2. Create an appropriate usability test plan.
3. Measure the usability of a product by analyzing the data from the performance and preference metrics.
4. Recommend changes based upon the results of a usability test.

HCI. Developing Effective Interfaces
Minimum core coverage time: 3 hours

Topics:
- Understanding the user experience
- Understanding interaction styles
- Matching interface elements to user requirements
- Graphical user interfaces
- Non-graphical user interfaces
- Localization, globalization
- Development tools - environments, HTML
- Prototyping
Core learning outcomes:
1. Explain how the UI and usability affect one another.
2. Define the different types of interaction styles.
3. Select an appropriate UI interaction style for a task.
4. List examples of localization and globalization that would impact design.
5. Implement a simple UI.

Advanced learning outcomes:
1. Describe ways in which users’ characteristics (i.e., age, education, cultural differences, etc.) require adaptation of a user interface to increase effectiveness.
2. Describe techniques for developing prototypes of user interfaces.
3. Describe user interface options for devices that do not support visual user interfaces.
4. Critique the differences between low-fidelity and high-fidelity prototyping.
5. Design a low-fidelity GUI prototype for an application which can be evaluated to guide development for a higher-fidelity prototype.
6. Using a prototyping tool, develop a high-fidelity prototype of a GUI which incorporates feedback from early usability testing.
7. Develop prototypes using different I/O modalities to accomplish the same task.
8. Develop prototype interfaces for devices that do not have graphical displays.
9. Given examples of the type of input required from a user, evaluate the effectiveness of different interaction style options.

HCI. Accessibility
Minimum core coverage time: 2 hours

Topics:
Biometrics
Repetitive stress syndrome
Accessibility guidelines and regulations
   ADA 508
   NIMAS
   UDL
   WCAG

Core learning outcomes:
1. List some of the advantages and disadvantages of biometric access control.
2. Describe the symptoms of repetitive stress syndrome and list some of the approaches that can ameliorate the problem.
3. Identify sources of accessibility guidelines and standards.
4. List some of the impacts of at least one guideline or standard on designing computer-based applications.
5. Demonstrate the use of accessibility features, such as a narrator.

Advanced learning outcomes:
1. Choose a biometric access system for a given application and include the criteria used for making the choice.
2. Design a new interface to accommodate users with a particular disability.
HCI. Emerging Technologies  
*Minimum core coverage time: 2 hours*

**Topics:**
- Alternative input/output devices
- Alternative displays (heads-up, goggles, etc.)
- Mobile computing
- Wearable computing
- Virtual reality systems
- Pervasive computing
- Sensor-nets

**Core learning outcomes:**
1. List several of the emerging alternative I/O devices.
2. Describe the difference between mobile computing and wearable computing.
3. Describe and give examples of pervasive computing.

**Advanced learning outcomes:**
1. Critique emerging I/O devices as compared to current devices.
2. Modify the design of an application to be used on a mobile device.
3. Describe the ideal characteristics of a wearable display and compare these to what can be done with current technology.
4. List the desirable and undesirable characteristics of a virtual reality system.
5. Illustrate how an emerging device could change the design of an interface for an application.
6. List some characteristics and capabilities of sensor nets.

HCI. Human-Centered Computing  
*Minimum core coverage time: 1 hour*

**Topics:**
- Human-centered design methods
- Software development lifecycle
- User analysis – profiles, personas
- Social computing
- Task analysis
  - Scenarios
  - Use cases

**Core learning outcomes:**
1. Explain the characteristics of human-centered design methods.
2. List the advantages and disadvantages for using a human-centered software development approach.
3. Identify a situation in which a user need can be addressed by a software product.
4. Describe, in scenario form, a problem situation to be addressed by a new or redesigned product.

**Advanced learning outcomes:**
1. Explain how human-computer interaction considerations impact the software development lifecycle.
2. Integrate appropriate user-centered design methodologies into the development of an application or product.
3. Survey a user environment to effectively design software.
4. Analyze a user population and develop generalized profiles for each user group.
5. Compare user groups and develop appropriate personas to represent them.
6. Develop appropriate user personas to be used during the product design phase.
7. Select appropriate user tasks for the application under consideration.
8. Measure the effectiveness of a design of an application or product during different stages of a software development lifecycle.
9. Describe the impact of socialization on the effectiveness of an application interface.