ITE 101 Survey of Computing **3 cr.**

Catalog description:

This course provides an overview of fundamental areas in computing, introducing basic vocabulary, central concepts, and typical applications. The areas surveyed include computer hardware, computer arithmetic, operating systems, programming constructs, programming languages, information storage and retrieval, databases, networking**,** and the social context of computing. Three lecture hours per week.

Prerequisite(s): Fulfillment of the Basic Mathematics Competency Based Skills requirement and ability to use standard computer software (e.g., operating system features, word processing, email, and web browsers).

Course Narrative:

"Computing" as a discipline encompasses a number of subdisciplines, specifically including information Technology, Computer Science, Computer Systems, and Software engineering. This foundation course covers the fundamentals of computing that apply to all the fields mentioned above. After finishing this course, students will be able to understand what Computing as a discipline encompasses. This course is structured in such a way that various layers of computing are discussed one after the other, for example, the information layer deals with the binary arithmetic and presents how computers only understand ones and zeros in the form of high and low voltage levels respectively. After this layer, the hardware layer is presented. Boolean logic and its physical interpretation through hardware implementation as logic gates and combination of these gates to form more complex circuitry are then presented. Once the students get used to the objectives of being able to use correct technical terminology and understand the conversion of text and numeric data between binary form and human readable form, more complex objectives are then presented.

The next objective is to understand the Fetch-Execute cycle and its role in the operation of a computer system. Von Neumann architecture and how the CPU fetches the instructions and data from memory and processes them are discussed here. After this, the programming layer is then introduced to students where students are introduced to the basics of flowcharts, pseudo code, and programming structures. The operating system layer is then introduced, where students learn how operating systems form the major force behind automation of the process of the computer. The operating system's major functions of memory management and CPU scheduling are discussed as a means to understanding the role of an operating system in a computing system. Finally, databases and computer networks are discussed as to how various computers are networked together and how databases work. Computer security and privacy issues are also discussed at various stages as the course proceeds.

Goals:

The aims of this course are to help the student to gain an appreciation for the breadth and variety within the computing field and to be better prepared for the technical treatments presented in later courses. Specifically, the goals are:

G1: to acquaint the student with many of the major subdivisions within academic computer science;
G2: to provide a standard descriptive vocabulary for these topic areas;
G3: to provide a survey of the most important concepts in each topic area.

Objectives:

Upon successful completion of this course the student will have demonstrated the ability to:

O1: use correct technical terminology to name and describe the principal hardware and software components of a computer system;
O2: understand the conversion of text and numeric data between "human readable" form and binary form;
O3: understand and explain the instruction cycle ("fetch/execute cycle") and its role in the operation of a computer system;
O4: use correct terminology to describe the various measurements of capacity and speed relating to a computer system;
O5: name and understand the principal classifications of files and software, and the differences and distinctions among them;
O6: name and explain the four principal programming paradigms;
O7: understand the basics of computer networks;
O8: name the principal functional components of an operating system and describe the main responsibilities of each one;
O9: give a general description of such topic areas as database systems and artificial intelligence;
O10: give a general description of such topics as software piracy, liability, privacy concerns, and computer security, and current thinking and controversies in each area.

Program Objective / Course Objective matrix (For ABET Accreditation Purposes)

(The following Matrix maps the Program Objectives for Information Technology Program outlined by Accreditation Board of Engineering Technology (ABET) with the Course Objectives. The check marks below the course objective represent that those course objectives accomplish specific program objectives set forth by ABET. The program objectives that have a * in front of them means that that course does not address those program objectives.)

Program Objective	**O1**	**O2**	**O3**	**O4**	**O5**	**O6**	**O7**	**O8**	**O9**	**O10**
PO-A: An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PO-B: An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.				✓						
***PO-C:** An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.										
***PO-D:** An ability to function effectively on teams to accomplish a common goal.										

Program Objective	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10
PO-E: An understanding of professional, ethical, legal, security and social issues and responsibilities.										✓
***PO-F:** An ability to communicate effectively with a range of audiences.										
PO-G: An ability to analyze the local and global impact of computing on individuals, organizations, and society.										✓
***PO-H:** Recognition of the need for and an ability to engage in continuing professional development.										
***PO-I:** An ability to use current techniques, skills, and tools necessary for computing practice.										
***PO-J:** An ability to use and apply current technical concepts and practices in the core information technologies.										
***PO-K:** An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.										
***PO-L:** An ability to effectively integrate IT-based solutions into the user environment.										
***PO-M:** An understanding of best practices and standards and their application.										
***PO-N:** An ability to assist in the creation of an effective project plan.										

Topics:

The column on the right hand side represents the Body of Knowledge and number of hours (in parenthesis) set forth by ABET accreditation board for accomplishing minimum required hours assigned for different categories.

More information on this body of knowledge can be found in Appendix A "The IT Body of Knowledge" on Page 68 of the following document.
http://www.acm.org//education/curricula/IT2008%20Curriculum.pdf

- introduction: **SP1(1)**
  - history of computing (survey)
  - What is a computer? (operational definition)
  - fundamental computer capabilities (read, write, store, compute, compare)
  - components of a typical computer
- the role of the computer **SP2(0.5)**, **SP3(2.5)**
  - as a communications tool
  - as an information resource
  - as a problem-solving tool
  - as a real-time control mechanism
- computer hardware **SIA7(1), PT2(5.5),** PT6(2) (not core)
  - logic gates and circuits
  - binary, octal, and hexadecimal numeration systems
  - machine representation of numbers
    - integers
    - 2's complement representation of negative numbers
    - floating point numbers
  - computer arithmetic
  - CPU structure
  - main memory structure
  - secondary storage devices (disk, tape)
  - I/O devices and their operation
  - multiprocessor systems
  - parallel processing
- communicating with a computer **IM1(1), SP1(1)**
  - files (text vs. binary, sequential vs. direct)
  - organization of text data (items, fields, records, files)
  - coding of text (ASCII, Unicode, etc.)
  - markup languages, hypertext
  - machine language **SIA7(2)**
    - memory addresses
    - program counter, instruction register
    - the instruction cycle
    - instruction set, operation codes
  - symbolic languages **IPT7(4.5)**
    - assembly languages
    - high-level programming languages
      - → language specification: syntax diagrams, EBNF
      - → language translation: assemblers, compilers, interpreters
      - → lexical analysis, parsing, code generation
    - programming paradigms
      - → procedural, declarative, functional, object-oriented
    - programming languages, past and present
- problem-solving, program design and programming
  - data types, variables, constants **PF2(0.5)**

- control structures **PF1(1), PF2(1)**
- modules
- problem analysis
- requirements and specifications **PF2(1.5)**
- solution design
- algorithms **PF4(1), PF2(1)**
- software testing and evolution **SIA5(1)**
- the human dimension of software: clarity & convenience of use **HCI(0.5)**

- information storage and retrieval
  - goals
  - conceptual vs. physical organization of data **IM1(0.5)**
  - data structures **PF1(1)**
  - databases, database systems, and database management **IM2(0.5)**
  - database query languages **IM5(1)**
  - operating systems **PT1(3.5)**
  - the purposes of an operating system
  - resource allocation
  - system tools: editors, linkers, loaders, other utilities
  - scheduling
  - virtual memory
- artificial intelligence
  - goals and issues
  - expert systems
- the social context of computing
  - appropriate vs. inappropriate **SP3(0.5)**
  - codes of ethics for computer users and professionals **SP7(1)**
  - intellectual property standards **SP4(1.5)**
  - privacy, civil liberties **SP9(1)**

Student Experiences:

Assignments

Homework assignments, given weekly, will exercise theoretical principles discussed during the lectures through practical exercises. Assignments require students to use information given during the lectures and textbooks, and perform Internet research for necessary materials.

Each assignment has a specific due date, with a short grace period during which the assignment may be submitted for reduced credit. When the grace period has expired, the assignment will no longer be accepted, and a student who has failed to submit the assignment will have a penalty deducted from the term point-total.

Other than the Homework Assignments, there will be quizzes, projects, in class presentations, midterm, and a cumulative final.

Grading

Final grades will be determined on the basis of the following approximate weights:

- Homework assignments, Quizzes, in-class exercises, Projects, Class Presentations 60%
- Midterm exam 20%
- Final exam 20%

Student Experiences by Course Outcome (Objective) matrix

	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10
Homework Assignments		✓		✓	✓		✓		✓	✓
Quizzes	✓	✓	✓	✓	✓			✓	✓	
Hour Examinations	✓	✓	✓			✓	✓	✓		✓
Final Examination	✓	✓	✓	✓	✓		✓	✓		✓

Bibliography:

Dale, Nell; Lewis, John. **Computer Science Illuminated**. **Sixth Edition**. Jones & Bartlett, 2015.

Forouzan, Behrouz A. & Mosharraf, Firouz. **Foundations of Computer Science**. **Third Edition**. Cengage Learning Business Press, 2014.

Brookshear, J. Glenn. **Computer Science: An Overview**. **Eleventh Edition**. Addison-Wesley, 2014.

Downs, Timothy Edward; White, Ron. **How Computers Work**. **The Evolution of Technology**. **Tenth Edition**. Que (Macmillan Computer Publishing), 2014.

Dale, Nell; Lewis, John. **Computer Science Illuminated**. **Fifth Edition**. Jones & Bartlett, 2013.

Anderson, Greg; Ferro, David; Hilton, Robert. **Connecting with Computer Science**. **Second Edition** Thompson Course Technology, 2010

Baase, Sara. **A Gift of Fire**. **Social, Legal, and Ethical Issues for Computers and the Internet. Fourth Edition**. Pearson Education, Inc., 2012

Spinello, Richard. **CyberEthics: Morality and Law in Cyberspace**. **Fourth Edition**. Jones & Bartlett, 2010.