

SOUTHERN UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE
UNDERGRADUATE PROGRAM

2017 - 2020



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The Department of Computer Science

The Department of Computer Science promotes academic excellence through counseling and scholarly activities that encompass courses of study that provide the foundation necessary for graduate work, professional training and advancement, and a successful career as a scientist. Courses of study enable future teachers to provide basic instruction in areas of science and other educational programs. Graduates of the department receive an education that prepares them to apply theoretical and practical solutions to societal problems.

We strive to instill in students an appreciation for science as an area of human experience used in exploring and understanding the universe; research and cooperative work experience for students form an integral part of its educational programs.

History

The Department of Computer Science was established as a distinct instructional unit in the College of Sciences at Southern University in 1968 and moved to the College of Sciences and Engineering in 2017. Over the last 40 plus years over 3,000 degrees, both Bachelors and Masters were awarded. Our students have pursued careers in various businesses and educational enterprises.

Our department has a foundation of quality in education and research instituted by its founders. Our Bachelor of Science degree program has a long history; it was established during a time when computer science was just becoming recognized as a major discipline in universities across the country. The department built on its strong foundation in computer science to add additional programs over the years.

Currently our program serves well over 400 majors. In addition, the department offers a variety of service courses to over 500 non-majors

who seek practical experience in the application of information technology. Our department offers two programs, BS and MS. This program is accredited by the Computing Accreditation Commission of ABET (<http://www.abet.org>)

Undergraduate Program

The undergraduate program in Computer Science prepares students to pursue further studies in Computer Science or in related fields of Science, Engineering, and Business and to enter the work force as entry level computer and information technology professionals. The program combines a very thorough preparation in the fundamentals of Computer Science and related fields.

There are four concentrations to choose from in our undergraduate program, Cybersecurity, Data Analytic & Sciences, Mobile Application, and Information Systems, all leading to the Bachelor of Science Degree. All of these concentrations provide the students with a firm foundation for graduate study, scientific research, and careers in scientific computing and commercial. This program is accredited by the Computing Accreditation Commission of ABET (<http://www.abet.org>)

Student Outcomes

- ▶ An ability to apply knowledge of computing and mathematics appropriate to the discipline,
- ▶ An ability to analyze a problem, identify and define the computing requirements appropriate to its solution,
- ▶ An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs,
- ▶ An ability to function effectively on teams to accomplish a common goal,
- ▶ An understanding of professional, ethical, legal, security and social issues and responsibilities,

- ▶ An ability to communicate effectively with a range of audiences,
- ▶ An ability to analyze the local and global impact of computing on individuals, organizations, and society,
- ▶ Recognition of the need for and an ability to engage in continuing professional development,
- ▶ An ability to use current techniques, skills, and tools necessary for computing practice.

Our program emphasizes the following eleven core areas in computer science:

1. Algorithms and Data Structures
2. Programming Languages
3. Computer Architecture
4. Numerical and Symbolic Computation
5. Operating Systems
6. Database Management
7. Data Networking
8. Software Design and Methodology
9. Cybersecurity
10. Human-Computer Interaction
11. Web/App Development

Admission Requirements

To be admitted to the computer science program, students must declare major as computer science. Also, a minimum of 17 credit hours and earned a “C” or better in each of the following courses, and pass the “Writing Proficiency” exam.

- ENGL 110__ Freshman Composition
- ENGL 111__ Freshman Composition
- CMPS 110__ Computer Science Seminar
- CMPS 111__ Computer Science Seminar II
- CMPS 190__ Modular Programming I
- CMPS 191__ Modular Programming II
- MATH 264__ Calculus I

Applicants who satisfy the above requirements, but have not adequately passed all courses, will be “Conditionally Admitted.” This action is

contingent upon Applicants enrolling at the next opportunity in each missing course cited and earning a “C” or better within one year.

A. Transfers from other Colleges within the University

Students transferring from other colleges at the University must meet the same requirements as above. Transfer credits are acceptable for degree programs if they represent course requirements in the appropriate curriculum. Course work pursued at other colleges shall be reviewed and approved by the departmental chair and by the dean of the college for its applicability to the specific requirements for a degree.

B. Transfers from other Universities

Students transferring from other approved colleges or universities must meet the admission requirements of the University and the College. Transfer students must submit an official transcript of courses completed at other institutions together with evidence of good standing to the Registrar at Southern University, Baton Rouge.

Course work pursued at other institutions shall be reviewed by the departmental chair and the dean of the college for its applicability to the requirements for a degree.

Computer Science Course Requirements:

All courses designated in the curriculum sheet by the prefix CMPS are considered to be required courses for CS majors and a grade of "C" or better is required.



Transfer Credits ~ Transfer courses can be substituted or used to satisfy the requirements for Computer Science courses if, and only if:

- The course contents, rigor of presentation, and prerequisites are equivalent, and
- Transfer credits come from Computer Science programs that are accredited by CAC/ABET.

Degree Requirements

The Computer Science Degree requires 120 semester hours, of which 41 must be in core Computer Science courses, 18 hours in specified concentration, 12 hours in Natural Science, and 14 hours in Mathematics. Students must earn a minimum grade of “C” in all required and elective courses in Computer Science, Biology, Chemistry, Physics, Mathematics, and Business. See Appendix for specified course requirements for each concentration.

Minor in Computer Science

A full time student at Southern University may minor in Computer Science upon a successful completion of 21 hours in Computer Science as follows: CMPS 190, CMPS 191, CMPS 200 or 271, CMPS 201, CMPS 300 and 6 hours in CMPS 300-400 Electives. The Computer Science Electives may be chosen from any of the 300 or 400 level courses offered as long as the student meets the prerequisites of the course. Thus, it may be required that a student take an additional class.

Non Computer Science Elective Courses

Some computer science courses are designed primarily for non-majors and cannot be used as electives, Introduction to Computer Technology (CMPS 105), C Programming (CMPS 270), Microcomputer Applications in Business (CMPS290), Advanced Techniques Using Spreadsheets (CMPS 291).

Computer Science Elective Courses

A Computer Science student may select computer science electives from our exciting list of courses listed below. Any Computer Science courses offered which are not specified as a required course for selected concentration can also be used. For more details concerning electives please contact your advisor.

CMPS 305	Social Networking
CMPS 310	Game Programming
CMPS 315	Information Systems
CMPS 318	Computer Animation
CMPS 335	Wireless Sensor Networks
CMPS 340	Practical Experience II
CMPS 350	Web Based Programming
CMPS 355	Cyber Forensics
CMPS 360	Scientific Programming
CMPS 365	Computers, Information and Society
CMPS 371	Advanced Object-Oriented Prog
CMPS 372	Cloud Computing
CMPS 375	Information Security
CMPS 385	Legal Issues in Information Tech
CMPS 386	Modeling & Simulation
CMPS 387	Object Oriented Design Patterns
CMPS 388	Human-Computer Interaction
CMPS 402	Computer Architecture
CMPS 407	Numerical Methods
CMPS 412	Theory of Computing
CMPS 415	System Analysis and Design
CMPS 425	Robotics
CMPS 426	Network Security
CMPS 432	Distributed Processing
CMPS 433	Telecommunications
CMPS 434	Networks and Graph Theory
CMPS 435	Introduction to Neural Networks
CMPS 436	Parallel Computing and Application
CMPS 440	Practical Experience II
CMPS 455	Special Projects
CMPS 470	Computer Graphics
CMPS 480	Artificial Intelligence
CMPS 485	Disaster Recovery
CMPS 493	Foundations of Cryptography
CMPS 494	Cryptographic Protocols
CMPS 495	Enterprise Security Management
CMPS 496	Internet Security Protocols

African American Experience Requirements

Students, who were first-time freshmen at any post-secondary institution on August 1, 1991, or at any time thereafter, will be required to pass a three credit hour course in African-American Studies before graduation. Students satisfying this requirement by electing one of the several African-American related courses in the Arts and Humanities.

English 203	Intro to Black American Literature
English 313	Black American Literature
English 407	Black Literature of the Deep South
English 413	Modern Black Prose Fiction
English 414	Contemporary Black American Poetry
History 311	Black American History
History 401	History of the American Negro
Music 352	Music of Black Americans: A Survey of Afro –American Music
Music 353	History of Jazz

Note: English 203 will satisfy both requirements African American Experience and English Literature.

Community Service Requirements

The university policy is that “students who were first-time freshmen at any post-secondary institution on August 1, 1991 or at any time thereafter will be required to complete a minimum of 60 clock hours of community service as one of the requirements for graduation.” The registrar’s office, through the Office of Service Learning, will verify the completion of that requirement either for credit or noncredit.

For more information regarding this requirement see the Community Service Program on campus or talk with your advisor.

Academic Advisement

Once the student has declared their major as Computer Science, an advisor will be assigned to the student by the department chairperson. The

most important thing to remember is that proper advisement is the key to success. Hence, the student should do the following:

- ▶ Schedule an appointment with your advisor in order to develop a progressive study plan
- ▶ Periodically update your records and study plan with your advisor
- ▶ Seek your advisor’s approval before adding or dropping a class

Your advisor shall:

- ▶ Determine the requirements and sequence of format coursework for your study plan
- ▶ Evaluate your overall academic performance
- ▶ Assist you in selecting suitable electives
- ▶ Approve the number and level of Computer Science and related courses in any given semester.
- ▶ Determine the sequence of course which will allow the student to graduate (complete the program) in the least possible time
- ▶ Inform the student of possible date of graduation



Student Organizations

There are four student organizations in the departments:

- ▶ The Association of Computing Machinery (ACM)
- ▶ Association for Information Technology Professional (AITP)
- ▶ Upsilon Pi Epsilon (UPE) Honor Society
- ▶ The Robotics Club

All students are encouraged to join student organizations upon acceptance into the department. Membership in UPE is invitational based upon a grade point average of 3.0 or above in the junior or senior year.

Scholarships

The department supports a small number of scholarships (over a period not to exceed eight (8) semesters). Once awarded, the student must maintain a GPA of 3.0 or better in order to retain the scholarship.



INCOMING FRESHMEN

University Admission Checklist

You have completed the application process when all of the items listed below have been received by Office of Admissions:

- Application for Admission
- Official transcripts from each institution attended
- A copy of ACT or SAT scores
- A copy of immunization records
- A copy of social security card
- Application fee: \$20 (U.S Citizens) or \$30 (non-U. S Citizens) money order

Department's Important Reminders

- ▶ Graduate-level courses may not be used for undergraduate degree credit.
- ▶ Students will not be allowed to take more than 12 hours of Computer Science courses per semester.
- ▶ No course substitution is allowed for core computer science courses
- ▶ Students must earn a grade of "C" or better in English, Science and Math courses
- ▶ Applications for graduation are due the semester before the student plans to graduate.
- ▶ Humanities Electives can be satisfied with (HIST 114, 115, 230, 311, 399, 401, 410, 463, 486); three hours must be in literature (ENGL 201, 203*, 204, 205).
- ▶ Social Science can be satisfied with three hours of ECON 200 or ECON 205 and the remaining three hours must be selected from the following series of courses: economics (ECON 210, 370); geography (GEOG 210, 221, 401); political science (POLS 200, 210, 320, 402); sociology (SOCL 210, 324, 448); and psychology (PSYC 210, 315, 350).
- ▶ Art Electives can be satisfied with ARTS 200,210/211, 320, 330 and 440; MUSIC 200, 250/251, 352,353 and SPEECH AND THEATER 360.
- ▶ *ENGL 203 can be taken to satisfy the University African-American Experience requirement OR Humanities Elective, not both.
- ▶ For latest news and updates, don't forget to like Southern University Computer Science Department on Facebook!

Course Offering Schedule

	FALL	SPRING
Core	110	110
	111	111
	190	190
	191	191
	200	271
	300	334
	302	370
	378	378
	400	420
	450	450
	451	451
CyberSecurity	355	365
	385	485
	426	ELEC
Information	415	ELEC
Data Analytic	360	372
	402	412
	422	ELEC
Mobile App	393	372
	394	ELEC I
	350	ELEC II
Electives	305	310
	315	318
	335	340
	350	355
	360	365
	371	372
	375	385
	386	387
	388	402
	407	412
	415	425
	426	432
	433	434
	435	436
	440	455
	470	480
485	493	
494	495	
496		

The Department of Computer Science has twelve (13) faculty members with various interests in the areas of Telecommunications, Networking, Neural Networks, Software Engineering, Object-Oriented Programming, Multimedia Design, Web Programming, Game Programming, Computer Ethics, Robotics, Machine Learning, and Artificial Intelligence.

Dr. Ebrahim Khosravi, **Professor and Chair**, Research Interest: Network, Electronics, Theoretical Computer Science, and Robotics

Dr. Marilyn Antoine, **Assistant Professor**, Research Interest: Computer Literacy, Spreadsheet Engineering, Business and Financial modeling, Self-Efficacy

Dr. Shuju Bai, **Professor**, Research Interest: Bioinformatics, High Performance Computing, Big Data, and Database Management

Dr. Yaser Banadaki, **Assistant Professor**, Research Interest: Internet of Things, Big Data Science, Computer Security, Computational Science and Parallel Systems, Nanoelectronic and Information Systems, Artificial Intelligence and Neural Networks, Embedded and Real-Time Systems, Smart Health Care Technology

Dr. Nigel Gwee, **Professor and Faculty Senate President**, Research Interest: Machine Learning, Algorithmic Complexity, and Software Engineering

Dr. Lynette Jackson, **Assistant Professor**, Research Interest: Big Data, Computer Engineering, Mobile Applications, and Pair Learning

Dr. Osman Kandara, **Associate Professor**, Research Interest: Software Engineering, Data Mining, Robotics, Internet Security, and Algorithmic Development

Dr. Mathieu Kourouma, **Associate Professor**, Research Interest: Wireless Communications, Computer Architecture, Networking, Applications Development, and Database Design

Dr. Md Abdus Salam, **Professor and Graduate Coordinator**, Research Interest: Wireless Sensor Networks, Computer Architecture and Networking

Dr. Oleg Starovoytov, **Assistant Professor**, Research Interest: High Performance Computing, Molecular Dynamics Simulations, Big Data Analytics, Quantum Computing

Dr. Sudhir Trivedi, **Professor**, Research Interest: Neural Networks and Distributed Processing

Ratana Warren, **Lecturer**, Research Interest: Computer Literacy, Spreadsheet Business and Financial Modeling, Database Management

Dr. Shizhong Yang, **Assistant Professor**, Research Interest: High Performance Computation Algorithm, Software Design, 3D Visualization of Scientific Data, Digital Signaling Processing, Data Mining Application in Material Science and Bioinformatics

Southern University- Computer Science Department
Course Requirements – Bachelor of Science in Computer Science
2017 – 2020 CyberSecurity

First Semester			Freshman Year			Second Semester		
Course	Number	Credit	Course	Number	Credit	Course	Number	Credit
Computer Science Seminar I	CMPS 110	1	Computer Science Seminar II	CMPS 111	1	Computer Science Seminar II	CMPS 111	1
Modular Programming I	CMPS 190	3	Modular Programming II	CMPS 191	3	Modular Programming II	CMPS 191	3
English I	ENGL 110	3	English II	ENGL 111	3	English II	ENGL 111	3
History of Civilization I	HIST 114	3	History of Civilization II	HIST 115	3	History of Civilization II	HIST 115	3
Health/Physical Education	PHED	2	Analytical Geom. Cal II	MATH 265	4	Analytical Geom. Cal II	MATH 265	4
Analytical Geom. Cal I	MATH 264	4						
Total		16	Total		14	Total		14

First Semester			Sophomore Year					
Course	Number	Credit	Second Semester			Number	Credit	
Discrete Structures	CMPS 200	3	English Literature			ENGL 203	3	
Data Structures	CMPS 201	3	General Biology			BIOL	4	
Linear Algebra	MATH 233	3	Java Programming			CMPS 271	3	
General Physics I	PHYS 221	3	General Physics II			PHYS 222	3	
General Physics I Lab	PHYS 223	1	General Physics II Lab			PHYS 224	1	
Statistics	MATH 276	3						
Total		16	Total			Total	14	

First Semester			Junior Year					
Course	Number	Credit	Second Semester			Number	Credit	
Programming Languages	CMPS 300	3	Digital Data Networks			CMPS 334	3	
Computer Organization	CMPS 302	3	Object-Oriented Program			CMPS 370	3	
Cyber Forensics	CMPS 355	3	Software Engineering			CMPS 378	3	
Foreign Language I	FOLG 100	3	Foreign Language II			FOLG 101	3	
Social Science Elec I (Econ 200/205)		3	Social Science Elec II				3	
Total		15	Total			Total	15	

First Semester			Senior Year					
Course	Number	Credit	Second Semester			Number	Credit	
Operating Systems	CMPS 400	3	Computers, Info & Society			CMPS 365	3	
Legal Issues in Info Tech	CMPS 385	3	Database Management Sys			CMPS 420	3	
Network Security	CMPS 426	3	Capstone Project II			CMPS 451	2	
Humanities Elective	HUMN	3	Disaster Recovery			CMPS 485	3	
Arts Elective	ARTS	3	CS Elective				3	
Capstone Project I	CMPS 450	1						
Total		16	Total			Total	14	

Southern University- Computer Science Department
Course Requirements – Bachelor of Science in Computer Science
2017 – 2020 Information Systems

First Semester			Freshman Year			Second Semester		
Course	Number	Credit	Course	Number	Credit	Course	Number	Credit
Computer Science Seminar I	CMPS 110	1	Computer Science Seminar II	CMPS 111	1	Computer Science Seminar II	CMPS 111	1
Modular Programming I	CMPS 190	3	Modular Programming II	CMPS 191	3	Modular Programming II	CMPS 191	3
English I	ENGL 110	3	English II	ENGL 111	3	English II	ENGL 111	3
History of Civilization I	HIST 114	3	History of Civilization II	HIST 115	3	History of Civilization II	HIST 115	3
Health/Physical Education	PHED	2	Analytical Geom. Cal II	MATH 265	4	Analytical Geom. Cal II	MATH 265	4
Analytical Geom. Cal I	MATH 264	4						
Total		16	Total		14	Total		14

First Semester			Sophomore Year					
Course	Number	Credit	Second Semester			Number	Credit	
Discrete Structures	CMPS 200	3	English Literature			ENGL 203	3	
Data Structures	CMPS 201	3	General Biology			BIOL	4	
Linear Algebra	MATH 233	3	Java Programming			CMPS 271	3	
General Physics I	PHYS 221	3	General Physics II			PHYS 222	3	
General Physics I Lab	PHYS 223	1	General Physics II Lab			PHYS 224	1	
Statistics	MATH 276	3						
Total		16	Total			Total	14	

First Semester			Junior Year					
Course	Number	Credit	Second Semester			Number	Credit	
Programming Languages	CMPS 300	3	Digital Data Networks			CMPS 334	3	
Computer Organization	CMPS 302	3	Object-Oriented Program			CMPS 370	3	
Principles of Mgmt	MGMT 300	3	Software Engineering			CMPS 378	3	
Foreign Language I	FOLG 100	3	Foreign Language II			FOLG 101	3	
Social Science Elec I (Econ 200/205)		3	Social Science Elec II				3	
Total		15	Total			Total	15	

First Semester			Senior Year					
Course	Number	Credit	Second Semester			Number	Credit	
Operating Systems	CMPS 400	3	Elec BUS I (312,341,410)			BUS	3	
CS Systems Analysis	CMPS 415	3	Database Management Sys			CMPS 420	3	
Quant. Analysis in Bus	MGMT 306	3	Capstone Project II			CMPS 451	2	
Humanities Elective	HUMN	3	Elec BUS II (441,445,446)			BUS	3	
Arts Elective	ARTS	3	CS Elective				3	
Capstone Project I	CMPS 450	1						
Total		16	Total			Total	14	

Southern University- Computer Science Department
Course Requirements – Bachelor of Science in Computer Science
2017 – 2020 Data Analytic & Sciences

First Semester			Freshman Year			Second Semester		
Course	Number	Credit	Course	Number	Credit	Course	Number	Credit
Computer Science Seminar I	CMPS 110	1	Computer Science Seminar II	CMPS 111	1	Modular Programming I	CMPS 190	3
Modular Programming I	CMPS 190	3	Modular Programming II	CMPS 191	3	English I	ENGL 110	3
English I	ENGL 110	3	English II	ENGL 111	3	History of Civilization I	HIST 114	3
History of Civilization I	HIST 114	3	History of Civilization II	HIST 115	3	Health/Physical Education	PHED	2
Health/Physical Education	PHED	2	Analytical Geom. Cal II	MATH 265	4	Analytical Geom. Cal I	MATH 264	4
Analytical Geom. Cal I	MATH 264	4				Total		16
Total		16	Total		14			

First Semester			Sophomore Year					
Course	Number	Credit	Second Semester			Number	Credit	
Discrete Structures	CMPS 200	3	English Literature			ENGL 203	3	
Data Structures	CMPS 201	3	General Biology or Chemistry			BIOL/CHEM	4	
Linear Algebra	MATH 233	3	Java Programming			CMPS 271	3	
General Physics I	PHYS 221	3	General Physics II			PHYS 222	3	
General Physics I Lab	PHYS 223	1	General Physics II Lab			PHYS 224	1	
Statistics	MATH 276	3						
Total		16	Total				14	

First Semester			Junior Year					
Course	Number	Credit	Second Semester			Number	Credit	
Programming Languages	CMPS 300	3	Digital Data Networks			CMPS 334	3	
Computer Organization	CMPS 302	3	Object-Oriented Program			CMPS 370	3	
Scientific Programming	CMPS 360	3	Software Engineering			CMPS 378	3	
Foreign Language I	FOLG 100	3	Foreign Language II			FOLG 101	3	
Social Science Elec I (Econ 200/205)		3	Social Science Elec II				3	
Total		15	Total				15	

First Semester			Senior Year					
Course	Number	Credit	Second Semester			Number	Credit	
Operating Systems	CMPS 400	3	Cloud Computing			CMPS 372	3	
Theory of Computing	CMPS 412	3	Computer Architecture			CMPS 402	3	
Intro Data Analytic	CMPS 422	3	Database Management Sys			CMPS 420	3	
Humanities Elective	HUMN	3	Capstone Project II			CMPS 451	2	
Arts Elective	ARTS	3	CS Elective			CMPS	3	
Capstone Project I	CMPS 450	1						
Total		16	Total				14	

Southern University- Computer Science Department
Course Requirements – Bachelor of Science in Computer Science
2017 – 2020 Mobile Application

Freshman Year			Second Semester		
First Semester					
Course	Number	Credit	Course	Number	Credit
Computer Science Seminar I	CMPS 110	1	Computer Science Seminar II	CMPS 111	1
Modular Programming I	CMPS 190	3	Modular Programming II	CMPS 191	3
English I	ENGL 110	3	English II	ENGL 111	3
History of Civilization I	HIST 114	3	History of Civilization II	HIST 115	3
Health/Physical Education	PHED	2	Analytical Geom. Cal II	MATH 265	4
Analytical Geom. Cal I	MATH 264	4			
Total		16	Total		14

Sophomore Year			Second Semester		
First Semester					
Course	Number	Credit	Course	Number	Credit
Discrete Structures	CMPS 200	3	English	ENGL 203	3
Data Structures	CMPS 201	3	General Biology	BIOL	4
Linear Algebra	MATH 233	3	Java Programming	CMPS 271	3
General Physics I	PHYS 221	3	General Physics II	PHYS 222	3
General Physics Lab I	PHYS 223	1	General Physics Lab II	PHYS 224	1
Statistics	MATH 276	3			
Total		16	Total		14

Junior Year			Second Semester		
First Semester					
Course	Number	Credit	Course	Number	Credit
Programming Languages	CMPS 300	3	Digital Data Networks	CMPS 334	3
Computer Organization	CMPS 302	3	Object-Oriented Program	CMPS 370	3
Mobile Client Dev	CMPS 393	3	Software Engineering	CMPS 378	3
Foreign Language I	FOLG 100	3	Foreign Language II	FOLG 101	3
Social Science Elec I (Econ 200/205)		3	Social Science Elec II		3
Total		15	Total		15

Senior Year			Second Semester		
First Semester					
Course	Number	Credit	Course	Number	Credit
Operating Systems	CMPS 400	3	Cloud Computing	CMPS 372	3
Mobile Deployment	CMPS 394	3	Database Management Sys	CMPS 420	3
Web Development	CMPS 350	3	Capstone Project II	CMPS 451	2
Humanities Elective	HUMN	3	CS Elective I	CMPS	3
Arts Elective	ARTS	3	CS Elective II	CMPS	3
Capstone Project I	CMPS 450	1			
Total		16	Total		14

Computer Science Department- COURSE CURRICULUM PRE-REQUISITES

Course ID	Course Title	Pre-Requisite(s)
CMPS 110	Computer Science Seminar I	None
CMPS 111	Computer Science Seminar II	CMPS 110
CMPS 190	Modular Programming I	None
ENGL 110	Freshman Composition I	None
HIST 114	History of Civilization	None
PHED	Health/Physical Education	None
MATH 264	Analytical Geom. Cal I	Math 135 and 140, or Consent of the Department
FRMN 110	Freshman Seminar	None
CMPS 191	Modular Programming II	CMPS 190 with C or better
ENGL 111	Freshman Composition II	ENGL 110
HIST 115	History of Civilization	None
MATH 265	Analytical Geom. Cal II	Math 264 with C or better
FRMN 111	Freshman Seminar II	None
CMPS 200	Discrete Structures	Consent of Instructor
ENGL 203	English	English 110 and 111 with C or better
MATH 233	Linear Algebra	Math 135 and 140, or Consent of Department
PHYS 221	General Physics	Math 264
PHYS 223	General Physics Lab	PHYS-221-Corequisite
Math 276	Statistics	Math 264 with C or better
CMPS 201	Data Structures	CMPS 191 with C or better
BIOL	General Biology	None
CMPS 360	Scientific Programming	CMPS 191, MATH 264, and Consent of Department
PHYS 222	General Physics	Math 265
PHYS 224	General Physics Lab	PHYS-222-Corequisite
CMPS 300	Programming Languages	CMPS 201, and Consent of Department
CMPS 302	Computer Organization	CMPS 191, CMPS 200, and Consent of Department
CMPS	CMPS Elective	None
FOLG 100	Foreign Language	None
CMPS 334	Digital Data Networks	CMPS 200, CMPS 302, and Consent of Instructor
CMPS 370	Object-Oriented Programming	CMPS 201 and Consent of Department
CMPS 378	Software Engineering	CMPS 201 and Consent of Department
FOLG 101	Foreign Language	None
CMPS 400	Operating Systems	CMPS 302 and Consent of Department
CMPS 407	Numerical Methods	MATH 265 and Consent of Department
CMPS 412	Theory of Computing	CMPS 200 and Consent of Department
HUMN	Humanities Elective	None
ARTS	Arts Elective	None
CMPS 402	Computer Architecture	CMPS 302 and Consent of Instructor
CMPS 420	Database Management Systems	CMPS 201, CMPS 300
CMPS 450	Capstone Project I	Candidacy of graduation in Computer Science
CMPS 451	Capstone Project II	Candidacy of graduation in Computer Science
CMPS	CMPS Elective	None
MGMT 306	Quantities Business Analysis	Math 275 or 200 or Econ 275 or Mgmt 300 or 305 with C or better
CMPS 415	System Analysis	CMPS 201, CMPS 302, and Consent of Department
SOCL	Social Science Elective	None
BUSN	Business Elective	None

In addition to fulfilling the department's educational mission, faculty engage in research and professional development that allows them to remain current in their fields to provide technological leadership to the university, community and the region. The department makes a conscious effort to evaluate and incorporate new areas and technologies into its programs.

LONI



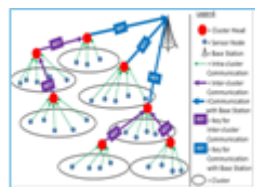
The Department is currently supporting the projects of the Louisiana Optical Network Initiative, or LONI, in Computational Materials Science and Computational Biomedical research. Our projects are funded by NASA, DOE, NSF, NIH, and Louisiana BOR. We have robotics, computational biomedical and high performance computing (HPC) labs to facilitate our students and faculty to perform the state-of-the-art computational science study.

ROBOTICS



The robotics program is partially funded by Raytheon at the present time. Our robotics program involves one faculty members along with many graduate and undergraduate students. Students engage in research, programming, testing and working hand-on with other Robotics Clubs. The Robotics laboratory is equipped with standard robots and robotic supporting facilities necessary to provide robotics training. The current research is to make an autonomous Humanoid Robot with face and voice recognition abilities.

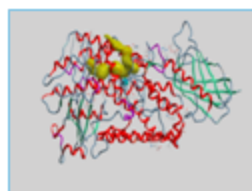
SENSOR NETWORK



Research is concentrated on the trustworthiness and reliability in distributed sensor networks using elliptic curve cryptography. We are focusing on the

development of optimization algorithm for number of cluster in a sensor networks and trust model for distributed systems.

BIOINFORMATICS



Our research focuses on modeling interactions between ligand and protein in lipoxygenase family using computational

approaches. We also develop and implement algorithms to improve molecular dynamics simulation. The long term goal of our research is to develop drugs for target proteins, which is important in biomedical research.

SOFTWARE ENGINEERING



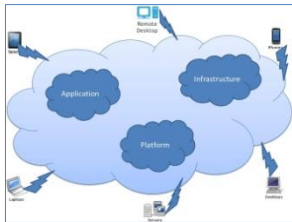
Software Engineering lies at the heart of computer science. It integrates the diverse disciplines of theoretical computer science, problem-solving, and programming into a unique and highly rewarding branch of engineering. The department's program equips students with the ability to build realistic large-scale software systems, using the most advanced techniques and tools currently available.

HIGH PERFORMANCE COMPUTING (HPC)

In our Computational Material Science research, we are using state-of-the-art software packages along with our own molecular dynamics codes to design novel materials for high temperature, corrosive and oxidation environment applications, mainly modern turbines and engines. The screened candidates will be validated by experiments in Southern, LSU, and national labs. Recent studies include Cr-based alloys,

Nb-based alloys, oxide dispersion-strengthened alloys (ODS), and high entropy alloys. In our high performance computing (HPC) research, we are developing new molecular dynamics codes to simulate and design the real materials both efficiently and accurately. Students will have great opportunities to use HPC facilities in LONI to perform simulation.

CLOUD COMPUTING

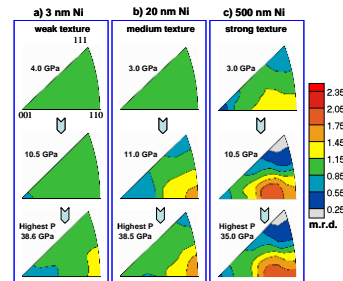


The Department currently conducts research in Cloud computing. Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). Research includes evaluation of various hypervisors such as KVM and VMWare. We are also implementing virtual machines and creating a Virtual Computing Lab using Apache VCL. The Cloud Computing program was funded by generous grant from IBM.

GAME PROGRAMMING



The Gaming program is a new area of research supported by the Computer Science Department. The area of gaming has grown rapidly over the past few years. We focus on both game playing strategies and game development. Our gaming program is currently headed by on faculty, involves several students and also includes a Gaming Club. We currently offer a Gaming Class and will also offer a concentration in gaming.



MATERIAL SCIENCE & ENGINEERING

After HPC materials design and

simulation, we perform nano materials synthesizing and state-of-the-art characterization on high entropy alloys, non-precious metal catalyst for fuel cells, thermal barrier coatings, and sun screening nano materials using XRD, high pressure synchrotron XRD at LBNL, neutron scattering in-situ characterization at ORNL, SEM, TEM, Infrared-IR, and Raman spectroscopy. Students have opportunities to design and perform experiments locally and at national labs.



The Computer Science Department has excellent computing facilities. Located within the department are ten laboratories associated with instruction and research. In addition, these major labs provide computer science major and faculty access to the Internet and the World Wide Web.

Computer Literacy Laboratory



There are twenty-nine (29) HP TouchSmart all-in-one computers with 4 GB of RAM in this laboratory. The computers provide enhanced multi-application performance. All computers are networked and have internet access. Another computer is for instructor, which is connected to the projector.

Microsoft Windows 7 Professional is the operating system with Microsoft Office 2016 Professional as the main packages.

This laboratory is used for courses CMPS 105 (Computer Literacy) and CMPS 290 (Microcomputer Applications in Business). The seating capacity for this laboratory is 30. These courses provide knowledge of the capabilities, limitations and implications of computer technology as well as an overview of the historical development of microcomputers in business. The focus is on application and use of operating system commands, word processing, spreadsheets, database managers, graphics, desktop publishing and presentation managers for business.

Architecture and Simulations Laboratory



This laboratory contains 10 HP TouchSmart all-in-one computers with 4GB of RAM and one IBM Laser Printer as well as one rear-projection SMART Board.

Microsoft Windows 7 professional is the operating system. There is some software available in this laboratory such as Microsoft Office 2016 Professional (Word, Excel, Access and PowerPoint), Dev C++, NetBeans IDE, WinSCP and putty (to access Linux/Unix system).

This laboratory is open for all students (both graduate and undergraduate) to do some research and their class work



Solaris Laboratory



This laboratory consists of 27 Sun Ray clients which are ideal for displaying server-hosted virtual desktops. The desktops in this laboratory are networked and have internet access. Another terminal is for the instructor, which is connected to the large display TV.

Graduate and undergraduate classes are held in this laboratory. Students write programs in C, C++, JAVA, Python, and FORTRAN. This laboratory is used for instructional and programming purposes

Computer Programming Laboratory



This laboratory contains two labs: 207 and 209. In Lab 207, there are 34 Lenovo All-in-one desktops with 8GB RAM and two HP TouchSmart all-in-one computers with 4GB of RAM; Another Lenovo is the instructional computer connected to large display TV. In Lab 209, there are 19 Lenovo All-in-one desktops with 8GB RAM and 22 HP TouchSmart all-in-one computers with 4GB of RAM; Another PC is for the instructor, which is connected to the large display TV.

Microsoft Windows 7 or 10 professional is the operating system. There is some software available in this laboratory such as Microsoft Office 2016 Professional (Word, Excel, Access and PowerPoint), Oracle 11g (for database class), Dev C++, NetBeans IDE, Game Studio, WinSCP and putty (to access Linux/Unix system).

This laboratory will be used for instruction and student use associated with the Software Engineering Option (planned). Both graduate and undergraduate classes will be held in this laboratory.

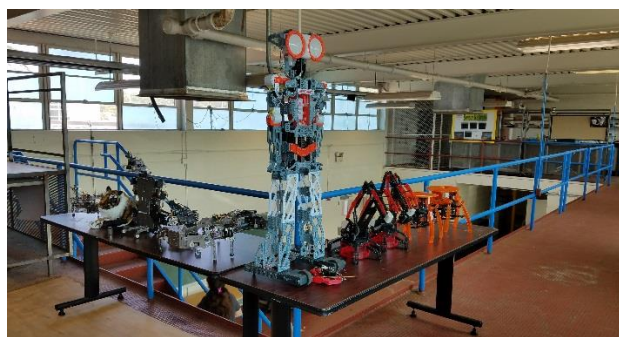
Server Network Monitoring Laboratory



This server room consists of one Dell PowerEdge 2400 Server which is a domain controller (Windows 2003), two Dell PowerEdge R720 Servers (Windows Server 2012R2), one is the primary DNS Server, the other one is the secondary DNS server. There is one new Sun Fire Server (Solaris 10) that serves all the Sun Ray Clients in the lab 205. There are two Dell Precision 330 Computers which are the departmental firewall. There is one Dell OptiPlex GX520 as a Mail Server. The systems in the laboratory are networked and have internet

access by way of two 24 port Nortel 450-24T switches, two Dell PowerConnect 2024 switches, two Linksys SRW224G4 switches and one 3COM 16 port 10/100 hub in this laboratory. This laboratory is used for network monitoring and network maintenance purposes. There are new server and SAN Storage used for faculties' research (cron and biomed-storage). Also there is the virtual system that consists of two hosts, two giga-switches and one array storage that will be used for virtual machine servers.

Robotics Lab



It is partially funded by Raytheon and at the present time involves one faculty and several undergraduate students doing the research, programming, testing, and works hands on with other Robotics Club students. The Robotics laboratory is equipped with standard robots and robotics supporting facilities necessary to provide robotics training. This laboratory has two QuadCrawler (4-legged) robots (Figure 1), one HexCrawler (6-legged) robot (figure 2) and Humanoid Robot (Human Eye) (figure 3). It is also equipped with a camera, sensors, Laptop, Tablet Pc, personal computers and some instruments.

The main object of this research is to make an autonomous robot which should

- be tall enough to reach and perform human activities
- be autonomous which means, it should be able to localize itself within a given environment and move autonomously on it, and all the computation and control must be performed onboard the robot.
- be able to interact with humans through voice commands
- be able to remember the person whom it met earlier using face recognition technology
- be able to climb stairs and pull itself up when fallen down
- be simple to control and light weighted.

Supercomputing Facilities

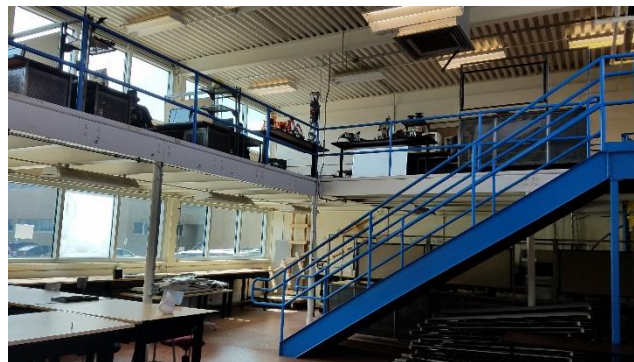
The following facilities are available at SU CMPS High Performance Computing (HPC) Lab for faculty and their students to use for the modeling test and mediate size job tests:

1) Supercomputers: SU CMPS faculties are actively involved in using LONI supercomputers to perform HPC simulation to solve biomedical and materials front-end problems. Specifically, the most powerful supercomputer, Queen Bee 2 (QB2), is the core cluster of LONI (SU is one of the LONI six major research universities). It is a 1.5 Petaflop peak performance cluster containing 504 compute nodes with 960 NVIDIA Tesla K20x GPU's, and over 10,000 Intel Xeon processing cores. It achieved 1.052 PF during testing, and premiered at number 46 on the [November 2014 Top500 list](#). The system is housed in the state's Information Systems Building (ISB), Baton Rouge. With special permission, faculty and students can also access and use LSU HPC SuperMIC, with 360 nodes of two 10-core and 64 GB memory each, which is compatible with QB2. These computers are supported by a whole array of peripheral hardware and software including Ethernet connections and all major telecommunication optical networks. With this equipment, we are able to perform large scale calculations that require both large memory and CPU time.

2) Data Storage & Servers: In the HPC Lab, there are three fast workstations for the modeling and preliminary code testing and a 32 TB JetStor 716F fiber connected storage for large biomedical data processing and saving. There are one HP9400 workstation with 4 CPU and 8 GB memory, one fast Windows XP workstation with 4 CPU and 64 GB memory for fast visual processing and large-scale data communication. One extra SUN X4240 workstation with 12 core and 8 GB (updatable to 32 GB) memory can perform fast optical network communications with bandwidth larger than 10 GB. A HP Proliant 490c G7 blade server with 36 core (three blades, updatable to 8 blades) connecting with optical VC flex-10 Enet module and i setting up for high speed network, biomedical, and material modeling, test, and mediate size HPC simulation.

The Lab has purchased VASP, MedeA, CHARMM, AMBER, Wien2K, ICM Pro, and some data processing packages (CrystalMaker, WXDragon etc.) for

modeling and code testing. Besides our material design software, LONI also has installed and supported following software on HPC systems: (1). applications: Fluent, Abacus, Matlab, Mathematica, Maple, ANSYS, LS-DYNA etc.; (2). compilers: C/C++, Fortran (IBM, Intel, PGI, GNU); (3). MPI: POE, MVAPICH, MVAPICH2, OpenMPI etc.; (4). libraries: MKL, GSL, ESSL, PESSL, NETCDF, HDF etc.; (5). grid: Globus, Condor, GRAM, GridFTP etc.; (6). Cybertools (<http://cybertools.loni.org/>). The above hardware and software are readily available for our course work and research program.



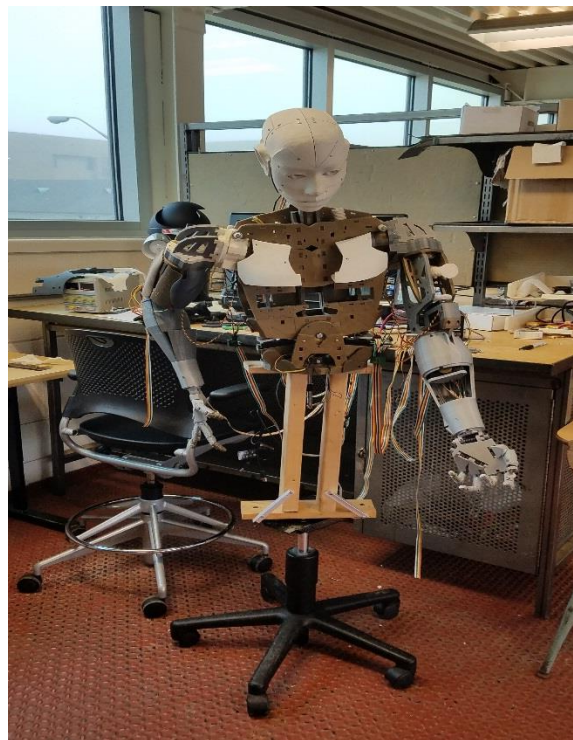
Bioinformatics Laboratory

This laboratory possesses one server (Dell PowerEdge T410) and several workstations. Research focuses on modeling interactions between ligands and proteins, molecular dynamics simulation of enzymes, and algorithm development for molecular dynamics.



High Performance Data Processing Laboratory

This laboratory contains 5 powerful Dell servers (Dell PowerEdge R720) and workstations. Research focuses on application of computational approaches to various scientific domains, development of computational frameworks for high through-put data processing, big data analytics.



105. INTRODUCTION TO COMPUTER TECHNOLOGY (Credit, 3 Hours). This course will provide knowledge of the capabilities, limitations and implications of computer technology. Not for credit for Computer Science Majors.

110/111. COMPUTER SCIENCE SEMINAR I & II (Credit 1 Hour Each). This is a two-part sequence course designed for freshman computer science majors. These courses provide a comprehensive overview of the scope and dynamics of computer science. Topics such as history of computing and technology, computers in modern society, computer application, legal and moral issues of computing and the computer scientist as a professional will be covered. A term project will also be assigned.

190. PROGRAMMING TECHNIQUES AND ALGORITHM DEVELOPMENT I (Credit 3 Hours). This course is the first of a two-course sequence for Computer Science majors and minors. This is a rigorous course stressing a disciplined approach to problem solving, algorithm design, logic development, and testing and debugging of programs. This course will emphasize procedure and data abstraction, the detailed study of a programming language, and the evolution of computer hardware and software technologies. A current programming language will be used as a vehicle for expressing algorithms.

191. PROGRAMMING TECHNIQUES AND ALGORITHM DEVELOPMENT II (Credit, 3 Hours). The second course in the two-course sequence for Computer Science majors and minors improving the analysis and design skills is the primary intent of this course. Emphasis is placed on problem analysis and design of systems, algorithm design and efficient coding techniques to optimize overall programming execution. Advanced techniques utilizing the language introduced in CMPS 190. Prerequisite: CMPS 190.

200. DISCRETE STRUCTURES (Credit, 3 Hours). Mathematical foundations of Computer Science, including fundamentals of logic, set theory, Boolean

algebra, graph theory and finite state machines. Prerequisite: Consent of Instructor.

201. DATA STRUCTURES (Credit, 3 Hours). This course is intended to present the data structures which may be used in computer storage to represent the information involved in solving problems (heaps, hash tables, B-trees). Emphasis will be placed on concepts of data abstraction and its implementation. Also sorting and searching techniques including arrays. Prerequisite: CMPS 191.

240. PRACTICAL EXPERIENCE I. (Credit, 3 Hours). This course enables those students who enroll to gain firsthand experience while employing concepts and theory gained from elementary coursework in Computer Science. This experience is achieved by the student successfully completing an assignment in business, industry or government over a period of one semester. Prerequisites: Sophomore classification and approval of advisor.

250. BUSINESS APPLICATIONS WITH COBOL (Credit, 3 Hours) Facilities will be developed in computer program structures, data processing procedures, structures of data files and programming in a business language (COBOL). This course is designed for students of Computer Science as well as students matriculating in the College of Business. Prerequisite: CMPS 190.

270. C PROGRAMMING (Credit, 3 Hours) This course is designed to introduce students to the basic UNIX operating system structure and "C" programming-UNIX commands and application program, system formats will be taught, calls, subroutines and file. The fundamentals of "C" programming will also be taught along with applications.

271. JAVA PROGRAMMING (Credit, 3 Hours) The fundamentals of Java Programming are taught in this course. The contrast between classical and object-oriented programming will be examined, with emphasis on the latter. The latest additions to the Java language specification will be additionally covered. A comparison between C++ and Java will also be discussed, to develop an appreciation of the

rationale for the emergence of these two object-oriented languages.

285. SYSTEM ADMINISTRATION AND MAINTENANCE (Credit, 3 Hours). This course will discuss the following topics: PCs' hardware; troubleshooting, repairing, and maintaining; operating systems and software; networking; security, and operational procedure. The theoretical and practical hands-on using the TestOut's LabSim gained in this course will prepare students to handle the most common and everyday PCs, networking, and security issues.

290. MICROCOMPUTER APPLICATIONS IN BUSINESS (Credit, 3 Hours). Overview of the historical development of microcomputers in business. The focus is on application and use of operating system commands, word-processing, spreadsheets database managers, and graphics, desktop publishing and presentation managers for business. Not for Credit for Computer Science Majors.

291. ADVANCED TECHNIQUES USING SPREADSHEETS (Credit, 3 Hours). This course consists of using a software package to enhance the business finance concepts such as financial amortization schedules, trend lines, forecasting, and integrating other software packages. Not for credit for Computer Science Majors.

300. PROGRAMMING LANGUAGES (Credit, 3 Hours). This course is intended to survey the significant features of existing programming languages with particular emphasis on underlying concepts abstracted from these languages. The structure of simple statements, the structure of algorithmic languages, list processing and string manipulation languages and including procedural, object-oriented, logic programming, and functional languages. Prerequisite: CMPS 201 and admission to the department.

302. COMPUTER ORGANIZATION (Credit, 3 Hours). Understanding the behavior of elementary computer hardware. Content of course deals with two state logic, flip flops, implementation of binary arithmetic, elementary Boolean algebra and elementary

computer design. Addressing modes; implementation of a data path; interfacing processors and peripherals. Prerequisites: CMPS 191 and CMPS 200 and admission to the department.

305. SOCIAL NETWORKING (Credit, 3 Hours). This course introduces students to a variety of existing, new and emerging concepts, strategies, and technologies utilized in today's online environment. It covers various social networking platforms, content, and tools, and related security and privacy issues in social media. Students will learn how to use social media to reach personal and professional goals.

310. GAME PROGRAMMING (Credit, 3 Hours). This course introduces students to the design and implementation of video games. Topics include basic game artificial intelligence, storyboarding, graphics and animation programming and sound. This course will require significant programming. This course will be extremely hands-on with the goal of successfully implementing most of the material covered in the course. The final project of the course will be the implementation of a video game.

315. INFORMATION SYSTEMS (Credit, 3 Hours). This course is designed to explore the structure, classification, features, and methodologies of modern computer based information systems. The various aspects of data storage, data mining, and information retrieval, transaction processing and business analysis will be emphasized. This course is designed to complement Systems Analysis and Design. Prerequisite: Consent of Instructor.

318. COMPUTER ANIMATION (Credit, 3 Hours). This course introduces students to the design and implementation of animations. Both programming and utilization of animation software will be covered with an emphasis on the latter. Topics include the history of animation and computer animation, understanding elemental topics in physics and geometry related to 3D animation, and understanding 3D computer animation techniques and algorithms. This course will require the use 3D rendering software such as Maya, Blender or Unity. This class will also cover the basics of animation

programming using Java and OpenGL programming. This course will be extremely hands-on with the goal of successfully implementing most of the material covered in the course. The final project of the course will be the implementation of a computer animation projects.

334. DIGITAL DATA NETWORKS (Credit, 3 Hours). This course will cover the standard topics in data communications and computer networks. Topics will include transmission media, analog and digital signals, analog-to-digital conversion, data transmissions, data encoding, effect of noise, error detection and correction, multiplexing, network topologies, standards and protocols, access methods and contention strategies, and data security. Laboratory exercises will be an integral part of this course. Prerequisite: CMPS 200 and CMPS 302 or Consent of Instructor.

335. WIRELESS SENSOR NETWORKS (Credit, 3 Hours). This course will cover the principles of wireless sensor networks protocols and basic of security issues. The focus will be given to the following topics: hardware architecture of sensor mote, memory management, power management. Students will learn various attacks and their solutions, applications of sensor networks, and advanced topics.

340. PRACTICAL EXPERIENCE II (Credit, 3 Hours). This course to gain firsthand experience enables those students who enroll while employing concepts and theory gained from intermediate coursework in Computer Science. This experience is achieved by the student successfully completing an assignment in business, industry or government over a period of one semester. Prerequisites: Junior classification and approval of advisor.

350. WEB-BASED PROGRAMMING (Credit, 3 Hours). This course will give the student the skills necessary to develop WWW applications from client/server architecture. Topic includes history and evolution of HTML; CGI, ActiveX, JavaScript, Perl, and Java Server Pages; securing Web applications, and other web programming options will be presented. Students

will work on a team project to develop Web-based solutions to business problems. Prerequisites: CMPS 300 or Consent of Instructor.

355. CYBER FORENSICS (Credit, 3 Hours). This course will cover the introduction to the various aspects in the field of Internet/cyber forensics such as the rules and integrity of evidence, legal processes, factual reporting of the information found, and providing expert opinion in a court of law or other legal administrative proceeding and contemporary methods in the preservation, identification, extraction, interpretation, presentation, and documentation of computer evidence.

360. SCIENTIFIC PROGRAMMING (Credit, 3 Hours). Specialized languages and tools for vector and parallel computation will be introduced. Facility will be developed in computer design program structures, problem definition and analysis, program design, algorithmic techniques and programming in a scientific language. Parallel approaches to matrix computations using such tools as high performance FORTRAN and message passing interface. Designed for those students who are interested in applications to computationally intensive problems in science and engineering. Prerequisites: CMPS 191, MATH 264, and admission to the department.

365. COMPUTERS, INFORMATION AND SOCIETY (Credit, 3 Hours). This course will cover the policies, legal issues and legislation, professional responsibilities and ethical issues in the discipline of Computer Science. Topics will include, but will not be limited to intellectual property, security and privacy, ethics, and Internet protocol. Prerequisites: CMPS 334 and admission to the department.

370. OBJECT-ORIENTED PROGRAMMING (Credit, 3 Hours). This course will introduce the student to the concepts underlying object-oriented programming. It reviews pointers, procedures and structures in C. It introduces the concept of classes and objects for problem analysis, design and solution. It covers the ANSI standard of C++, syntax and implementation aspects with a wide range of class definitions and object manipulations. Some commercially available

C++ program developments will also be discussed. Prerequisites: CMPS 201 and admission to the department.

371. ADVANCED OBJECT-ORIENTED PROGRAMMING (Credit, 3 Hours). This is an advanced course in object-oriented programming with JAVA and more intense than 370. Topic includes but not limited to: sub-typing, interfaces and abstract classes, overloading and overriding, multiple and repeated inheritance, polymorphic methods, dynamic binding, genericity, parametric polymorphism, message-passing, threads, remote method invocation, and automatic memory management. Prerequisite: CMPS 370 and admission to the department.

372. CLOUD COMPUTING (Credit, 3 Hours). This course introduces students to the design and implementation of cloud computing solutions. Topics include virtualization, public and private clouds, use of cloud computing resources, data centers, different cloud computing models, cloud computing storage solutions, security in cloud computing and IBM's Smart Cloud Computing. This course will also investigate motivating factors, benefits, challenges, Enterprise Software as a service and other service models of cloud computer. This course will be extremely hands-on with the goal of successfully using or implementing most of the material covered in the course. This course will investigate cloud computing solutions such as Google App Engine and Amazon EC2 and virtualization technologies such as Xen and VMWare. The final project of the course will be the implementation of a cloud computing solution.

375. INFORMATION SECURITY (Credit, 3 Hours). This course introduces the students to methods of securing cyberspace is an extraordinarily difficult strategic challenge. Topics include, but not limited to: formal specification and verification of security properties, operating system security, trust management, multi-level security, security labeling, security auditing and intrusion detection, security policy, safeguards and countermeasures, risk mitigation, covert channels, identification and authentication, password schemes, access control

lists, and data fusion techniques. Prerequisites: CMPS 334 and admission to the department.

378. SOFTWARE ENGINEERING (Credit, 3 Hours) The study of the software life-cycle that different applications go through, from conception to release and maintenance. Topics include, but are not limited to software requirements, software design, critical software systems, software verification and validation, software management, legacy systems, risk management; tool support; software process; discussion of CMM and ISO-9003. Students will be required to develop a large project in team setting. Prerequisite: CMPS 201 and admission to the department.

385. LEGAL ISSUES IN INFO TECH (Credit, 3 Hours). The student will learn about the relevance of computer crime and intellectual property laws when a network is compromised. Analyze the new laws and cases on database breaches. Evaluate the policies and procedures enterprises must implement to protect proprietary data and IT resources. A highlight of this course is a legal review of the emerging topics of honeypots and active defenses, i.e., enterprises hacking back against hackers. By the end of the course, participants will have a functional knowledge of the issues that shape information security evolving standard of due care. A key goal is to help students factor in legal concerns when they draft enterprise IT security policies. Students will debate what the words of an enterprise policy mean from a legal perspective.

386. MODELING & SIMULATION (Credit, 3 Hours). Current topics in modeling and simulation including statistical models, high performance computing and programming, simulation packages in material science and biomedical research, and result data analysis and processing.

387. OBJECT-ORIENTED DESIGN PATTERNS (Credit, 3 Hours). Advanced object-oriented design and implementation based on design patterns. Theoretical framework for the basis of design pattern classification into creational, structural, and behavioral patterns; application of specific patterns

(Abstract Factory, Builder, Factory Method, Adapter, Composite, Decorator, Proxy; Iterator, State, Strategy, and Template Method) to the design of software applications, to be implemented in one or more object-oriented languages. Prerequisites: CMPS 370 and admission to the department.

388. HUMAN-COMPUTER INTERACTION (Credit, 3 Hours). Introduction to the principles of Human-Computer Interaction in interface design of standalone and web-based applications. The course includes discussion on psychological, physiological, cognitive, cultural, ergonomic, and design issues in computer usage. Various design and implementation methodologies will be examined and contrasted, and applied in applications to be developed as coursework. The course will be project-driven and students will work on various team projects, and conduct testing on aspects of learning and usage of their software.

393. Mobile Client Development. (Credit, 3 Hours). Introduce the concepts involved in Mobile Client Development, discussions around why mobile, what causes a business to go mobile, the components usually used in a mobile deployment, and the general usage patterns for a mobile application. (Two perspectives: Consumer based applications and enterprise based applications).

394. Mobile Deployment. (Credit, 3 Hours). Introduce the concepts involved in Mobile Server Development, deployment and other inter-related dependencies that a server environment may require. Discussions around application development and deployment, communication methods, data exchange standards, logging, analytics, infrastructure concepts, troubleshooting, and interfacing with back-end systems will be discussed. Where applicable, there will be a call out difference between consumer infrastructure, enterprise infrastructure, and a discussion around using MBAAS (Mobile Back-end As a Service).

400. OPERATING SYSTEMS (Credit, 3 Hours). This course is intended to bring the student to grips with the actual programs encountered in systems

programming. Operating system principles, hardware/software interface, resource management, segmentation, paging, virtual memory; operating characteristics, user service and their limitations will be given. Overall structure of multiprogramming systems on multiprocessor hardware configurations will be treated, as well as details on addressing techniques, core management, and file system design and management. Prerequisite: CMPS 302 and admission to the department.

402. COMPUTER ARCHITECTURE (Credit, 3 Hours). An overview of computer systems, data representation, memory hierarchies and storage, input/output, addressing stack architecture, pipeline architecture, microprogramming, basics of pipelines and multiprocessors, and performance evaluation. Prerequisite: CMPS 302 or consent of the instructor.

407. NUMERICAL METHODS (Credit, 3 Hours). This course is designed to give a strong working knowledge in applying numerical methods to solve problems. Topics include various methods to approximate desired number, which may be a root, an integral, or a value of a function in a differential equation. All of the methods studied have numerous practical applications in science and engineering. Prerequisite: MATH 265 and admission to the department.

412. THEORY OF COMPUTING (Credit, 3 Hours). Topics covered will be grammars, languages and productions, automata and their languages, regular sets, Turing machines and recursive functions, effective numbering and universal machines. Prerequisite: CMPS 200 and admission to the department.

415. SYSTEMS ANALYSIS AND DESIGN (Credit, 3 Hours). Provides the student with tools and techniques used in analyzing manual or automated information systems with a view toward computer implementation of these systems in terms of accuracy and efficiency. Analysis, design, and implementation phases of software systems development using a phased life cycle approach;

modeling tools and CASE software. A team approach to software development and project management. Prerequisite: CMPS 201, CMPS 302, or consent of the instructor.

420. DATABASE MANAGEMENT SYSTEMS (Credit, 3 Hours). Topics include basic file organization: data structures, schemas, and subschemas, data models, relational, hierarchical, and network models, database reliability, database integrity, database protection, review of commercial database systems, programming in a database environment, and database administrator's role. Prerequisite: CMPS 201 and CMPS 300.

422. INTRODUCTION TO BIG DATA (Credit, 3 Hours). This course covers the knowledge of Big Data science. It serves as a senior level course for undergraduate students. The focus will be Big Data storage, processing, analysis, visualization, and applications. State-of-art computational frameworks for Big Data will be introduced to students. Students will learn the essentials of Big Data management, processing, and system reliability. Delivery of knowledge includes textbook, lectures, labs, lab assignments and projects. Prerequisite: CMPS201

425. ROBOTICS (Credit, 3 Hours). This course introduces fundamental concepts in Robotics. Basic concepts will be discussed including coordinate transformations, sensors, path planning, kinematics, feedback and feed forward control, stressing the importance of integrating sensors, effectors and control. The last part of the course will focus on applying the knowledge from the initial lectures to the key approaches to mobile robot control (reactive, behavior-based, and hybrid), and briefly discuss robot learning and multi-robot systems. In the lab, robot kits will be used in weekly exercises illustrating lecture material; the last month of the lab will be spent in applying the learned material to a final project, in which the students will design and build a robot for a final competition. This course is intended for undergraduate students with interests in Robotics, Visual Computing, and Artificial Intelligence.

426. NETWORK SECURITY (Credit, 3Hours). This course covers the principles of network security. The

focus will be given to the following: attack methods (targeted hacking attacks, denial-of-service attack), firewall architecture, host security, cryptography, e-commerce and email security, intrusion detection and response process, risk analysis, security architecture, control principles, and laws governing security issues.

432. DISTRIBUTED PROCESSING (Credit, 3 Hours). Topics include data communications principles, distributed processing networks, distributed databases, security, implementation, and management. Prerequisite: Senior standing in CS.

433. TELECOMMUNICATIONS (Credit, 3 Hours). Topics include communications environment, communications system components, networks and control common carriers, design of communications networks, and local area data networks. Design preparation and delivery of information, applications, and services using client/server computing over a wide-area network. Prerequisite: CMPS 334.

434. NETWORKS AND GRAPH THEORY (Credit, 3 Hours). The course is intended to illustrate how graph theory can be used to formulate and solve certain problems. The course consists of fundamental concepts of graph theory, some theorems concerning network flows, common and widely used algorithms for paths and trees, as well as flows and circuits. Direct computer implementation of the algorithms will be an integral part of the course. Prerequisites: CMPS 200 and MATH 233.

435. INTRODUCTION TO NEURAL NETWORKS (Credit, 3 Hours). Neural networks represent an emerging technology, and are becoming increasingly versatile. They are able to solve difficult nonlinear problems that are solvable using traditional methods. Inherently parallel design and ability to interact with the environment make neural networks ideal for large applications. This course will consider the design and implementation of neural networks. Topics include neural networks as problem solving tools; neural networks as self-organizing systems;

single or multi-layered perceptions; associative memory networks; techniques in neural learning, back-propagation, supervised and unsupervised learning. Issues related to neuro-computing hardware and neuro-VLSI implementation will be discussed. Prerequisite: Departmental Permission Only.

436. PARALLEL COMPUTING AND APPLICATION (Credit, 3 Hours). This course covers parallel programming paradigms, examining core concepts, focusing on a subset of widely used contemporary parallel programming models, and providing application in materials design, and biomedical research. Topics include parallel programming principles, Dell Linux cluster, GPU and CUDA, performance tune up of parallel codes in material science and biomedical research, and result data analysis and processing. Applications are drawn from diverse areas of science and engineering

440. PRACTICAL EXPERIENCE III (Credit, 3 Hours). This course enables those students who enroll to gain firsthand experience while employing concepts and theory gained from advanced course work in computer science. This experience is achieved by the student successfully completing an assignment in business, industry, or government over a period of one semester. Prerequisite: Senior classification and approval of advisor.

450. CAPSTONE PROJECT PHASE I. (Credit, 1 Hour). Provide the opportunity for students to demonstrate that they have achieved the goals for learning established by the University and the Department. The course is designed to assess cognitive, effective, and psychomotor learning, and to do so in a student-centered and directed manner which requires the command, analysis, and synthesis of knowledge and skills. The capstone course described here integrates learning from courses in the major with the courses from the rest of the academic experience. It requires the application of that learning to a project which serves as an instrument of evaluation. The course fosters interdisciplinary partnerships among university departments and helps cultivate industry alliances and cooperation. **Prerequisite:** student

must be a senior having completed all the requirements of the three years in Computer Science.

451. CAPSTONE PROJECT PHASE II. (Credit, 2 Hours). Provide the opportunity for students to demonstrate that they have achieved the goals for learning established by the University and the Department. The course is designed to assess cognitive, effective, and psychomotor learning, and to do so in a student-centered and directed manner which requires the command, analysis, and synthesis of knowledge and skills. The capstone course described here integrates learning from courses in the major with the courses from the rest of the academic experience. It requires the application of that learning to a project which serves as an instrument of evaluation. The course fosters interdisciplinary partnerships among university departments and helps cultivate industry alliances and cooperation. **Prerequisite:** student must be a senior in his/her second semester in Computer Science and have completed CMPS 450 with a grade of C or better.

455. SPECIAL PROJECTS (Credit, 3 Hours). Independent project implemented under the guidance of a member of the Computer Science faculty. Prerequisite: Departmental Permission Only.

470. COMPUTER GRAPHICS (Credit, 3 Hours). Algorithms, analysis, and software architecture for graphical information systems are covered; mathematics and algorithms for generating pictures and storing representations of pictures; calculus and linear algebra are used and modeling of solids is introduced. Prerequisites: MATH 233 (Credit or enrolled), MATH 265 and mastery of a computer language.

480. ARTIFICIAL INTELLIGENCE (Credit, 3 Hours). Fundamental concepts of artificial intelligence and its various and changing technologies, including: expert systems, natural language processing, computer perception and robotics, intelligent computer-assisted instruction. Students will design and implement a semester project using development tools existing in the Department of

Computer Science. Prerequisite: Consent of Instructor.

485. DISASTER RECOVERY (Credit, 3 Hours). Provides the student with real world examples, and an extensive introduction to disaster recovery focusing on planning the team, planning for the disaster, and practicing the plan to make sure that, if ever needed, it will work.

493. FOUNDATIONS OF CRYPTOGRAPHY (Credit, 3 Hours). This course provides a broad introduction to cornerstones of security (authenticity, confidentiality, message integrity and non-reputation) and the mechanisms to achieve them as well as the underlying mathematical basics. Topics include: block and stream ciphers, public-key systems, key management, certificates, trusted third party, public-key infrastructure, digital signature, non-reputation, and message authentication. Various security standards and protocols (DES, AES, PGP, and Kerberos) are introduced.

494. CRPTOGRAPHIC PROTOCOLS (Credit, 3 Hours). This course covers the design and analysis of secure protocols, and studies different attacks and defenses against them. Topics include: signature and authentication protocols, privacy, digital rights management, security protocols for wired, wireless

and distributed networks, electronic voting, payment and micropayment protocols, anonymity, broadcast encryption and traitor tracing, quantum cryptography, and visual cryptography. This course includes a project.

495. ENTERPRISE SECURITY PROTOCOLS (Credit, 3 Hours). Introduction to security management of computer and network systems. Protocols, specifications, security evaluations are discussed. Other topics include attacks, threats, and viruses, and the security of buildings and facilities.

496. INTERNET SECURITY PROTOCOLS (Credit, 3 Hours). Topics include secret key and public key cryptography, hash algorithms, authentication, Kerberos V 4 and V5, pretty good privacy, information hiding, IPSEC/NP, IPSEC key exchange,

SSL/TLS, PEM & S/MIME, firewall, intrusion tracing and response, worms and virus, and security measurements.