

Degree Type – Bachelor of Science (BS)**Degree Title – Computational Science**

**The Computational Science program offers students the opportunity to acquire a knowledge in computing integrated with knowledge in one of the following areas of study: (a) bioinformatics, (b) computational physics, (c) computational chemistry, (d) computational mathematics, (e) environmental science informatics, (f) health informatics, (g) digital forensics and cyber security, (h) business informatics, (i) biomedical informatics, (j) computational engineering physics, and (k) computational engineering technology. Graduates of this program major in computational science with a concentration in one of the above areas of study.
(Amended for clarification 12/5/2018).*

**Previous UTRGV language:*

Computational science graduates develop emphasis in two major fields, one in computer science and one in another field, in order to integrate an interdisciplinary computing degree applied to a number of emerging areas of study such as biomedicalc informatics, digital forensics, computational chemistry, and computational physics, to mention a few examples. Graduates of this program are prepared to enter the workforce or to continue a graduate studies either in computer science or in the second major.

STUDENT LEARNING OUTCOMES:

- 1. Knowledge:** Be well prepared for a professional career or graduate studies in computer science applied to a second major field of study.
- 2. Application:** Be able to apply computer science principles to realF world problems in a second field of study.
- 3. Organizational:** Have the skills to work effectively within an organization.
- 4. Ethical:** Understand ethical, professional and social issues related to the practice of their profession.

A – GENERAL EDUCATION CORE – 42 HOURS

Students must fulfill the General Education Core requirements. The courses listed below satisfy both degree requirements and General Education Core requirements.

Required**Mathematics – 3 hours**

For all concentrations:

MATH 2413 Calculus I (or MATH 2487 Honors) three-hour lecture

Life and Physical Science – 6 hours

For Bioinformatics, Biomedical Informatics, and Computational Chemistry concentrations:

CHEM 1311 General Chemistry I

CHEM 1312 General Chemistry II

For Computational Physics, Computational Mathematics, and Computational Engineering Physics concentrations:

PHYS 2425 Physics for Scientists and Engineers I three-hour lecture

PHYS 2426 Physics for Scientists and Engineers II three-hour lecture

For Environmental Science Informatics and Health Informatics concentrations:

BIOL 1406 General Biology I three-hour lecture (or BIOL 1487 Honors)

BIOL 1407 General Biology II three-hour lecture (or BIOL 1488 Honors)

For Digital Forensics and Cyber Security concentration:

BIOL 1406 General Biology I three-hour lecture (or BIOL 1487 Honors)

CHEM 1311 General Chemistry I

For Computational Engineering Technology concentration:

PHYS 2425 Physics for Scientists and Engineers I three-hour lecture

CHEM 1311 General Chemistry I

Social and Behavioral Sciences – 3 hours

For Health Informatics, Digital Forensics and Cyber Security, and Biomedical Informatics concentrations:

PSYC 2301 General Psychology

For Business Informatics, Computational Engineering Physics, and Computational Engineering Technology concentrations:

ECON 2301 Principles of Macroeconomics

Integrative and Experiential Learning – 5 hours

For all concentrations:

CSCI 1380 Computer Science I (or CSCI 1387 Honors)

Concentrations with specified Life and Physical Science courses must choose respective labs below:

BIOL 1406 General Biology I one-hour lab (or BIOL 1487 Honors)

BIOL 1407 General Biology II one-hour lab (or BIOL 1488 Honors)

CHEM 1111 General Chemistry I Lab

CHEM 1112 General Chemistry II Lab

PHYS 2425 Physics for Scientists and Engineers I one-hour lab

PHYS 2426 Physics for Scientists and Engineers II one-hour lab

B – MAJOR REQUIREMENTS – 67 HOURS (45 advanced)

1 – Computational Science Core – 28 hours (18 advanced)

CSCI 2333 Computer Organization and Assembly Language

CSCI 2380 Computer Science II (or CSCI 2388 Honors)

CSCI 3310 Discrete Data Structures

CSCI 3333 Algorithms and Data Structures

CSCI 3340 Software Engineering I

CSCI 4333 Database Design and Implementation

CSCI 4345 Computer Networks

CSCI 4390 Senior Project

ELEE 2130 Digital Systems Engineering I Lab

ELEE 2330 Digital Systems Engineering I

2 – Computational Science Electives – 9 hours (9 advanced)

Choose 9 hours of advanced CSCI courses.

3 – Concentration – 30 hours (18 advanced minimum)

Choose one of the following concentrations:

a – Bioinformatics – 30 hours (18 advanced)

i – Bioinformatics Core – 23 hours (11 advanced)

BIOL 1406 General Biology I (or BIOL 1487 Honors)

BIOL 1407 General Biology II (or BIOL 1488 Honors)

BIOL 2143 General Biology III Lab

BIOL 2343 General Biology III

BIOL 3409 Ecology

BIOL 3413 Genetics

BIOL 4301 Evolution

ii – Bioinformatics Electives – 7 hours (7 advanced)

Choose 7 hours of advanced BIOL courses.

b – Computational Physics – 30 hours (19 advanced)

i – Computational Physics Core – 23 hours (19 advanced)

MATH 2415 Calculus III

MATH 3341 Differential Equations

PHYS 3301 Electromagnetic Theory I

PHYS 3303 Thermodynamics

PHYS 3305 Classical Mechanics
PHYS 3402 Modern Physics
PHYS 4303 Quantum Mechanics I

ii – Computational Physics Electives –7 hours

Choose 7 hours of PHYS courses.

c – Computational Chemistry – 30 hours (18 advanced)

i – Computational Chemistry Core – 21 hours (13 advanced)

CHEM 2101 Analytical Chemistry Lab
CHEM 2301 Analytical Chemistry
CHEM 2123 Organic Chemistry I Lab

CHEM 2323 Organic Chemistry I
CHEM 3103 Biochemistry Lab
CHEM 3104 Physical Chemistry Lab
CHEM 3202 Inorganic Chemistry Lab
CHEM 3301 Inorganic Chemistry
CHEM 3303 Biochemistry
CHEM 3304 Physical Chemistry

ii – Computational Chemistry Electives – 9 hours (5 advanced)

Choose 9 hours of CHEM or PHYS courses, of which 5 must be advanced.

d – Computational Mathematics – 30 hours (26 advanced)

i – Computational Mathematics Core – 16 hours (12 advanced)

MATH 2415 Calculus III
MATH 3341 Differential Equations
MATH 3350 Introduction to Mathematical Proof
MATH 3352 Modern Geometry I
MATH 3363 Modern Algebra I

ii – Computational Mathematics Electives – MATH 6 hours (6 advanced)

Choose 6 hours of advanced MATH courses.

iii – Computational Science Electives – CSCI 8 hours (8 advanced)

Choose 8 hours of advanced CSCI courses.

e – Environmental Science Informatics – 30 hours (18 advanced)

i – Environmental Science Informatics – 18 hours (10 advanced)

ENVR 1401 Introduction to Environmental Science I
ENVR 1402 Introduction to Environmental Science II
ENVR 3301 Natural Resources Conservation
ENVR 3303 Research Methodology and Data Analysis in Environmental Sciences
ENVR 3405 Oceanography

ii – Environmental Science Informatics Electives – 12 hours (8 advanced)

Choose 12 hours of ENVR or GEOL courses, of which 8 must be advanced.

f – Health Informatics – 30 hours (22 advanced)

Requires admission to School of Biomedical Informatics from UT Health Science Center at Houston.

i – Health Informatics – 15 hours (7 advanced)

BIOL 2401 Anatomy and Physiology I
BIOL 2402 Anatomy and Physiology II
BIOL 4407 Animal Parasitology
HIUT 4300 Introduction to Health Informatics

ii – Health Informatics Electives – 12 hours (12 advanced)

HUIT electives must be approved by School of Biomedical Informatics from UT Health Science Center at Houston.

iii – Biological Systems Electives – 3 hours (3 advanced)

Choose one:

- BIOL 3310 Neurobiology
- BIOL 3345 Animal Nutrition
- BIOL 3405 Histology

g – Digital Forensics and Cyber Security – 30 hours (30 advanced)

- CRIJ 3303 Criminology
- CRIJ 3304 Criminal Justice Research Methods
- CRIJ 3310 The Constitution and Criminal Law
- CRIJ 3315 Forensic Investigation I
- CRIJ 3316 Criminal Evidence and Proof
- CRIJ 3320 Evidence for Forensic Investigation
- CRIJ 3416 Forensic Investigation II
- CRIJ 4230 Seminar: Forensics Investigation
- CRIJ 4321 White-Collar and Organized Crime
- CRIJ 4325 Medical-Legal Forensic Investigation

h – Business Informatics – 30 hours (21 advanced)

- ACCT 2301 Intro to Financial Accounting
- ACCT 2302 Intro to Managerial Accounting
- BLAW 3337 Business Law I
- ECON 2302 Principles of Microeconomics
- FINA 3380 Introduction Finance
- MARK 3300 Principles of Marketing
- MGMT 3361 Principles of Management
- MGMT 4363 Operations Management
- MGMT 4389 Strategic Management
- QUMT 3343 Statistical Methods for Business

i – Biomedical Informatics – 30 hours (18 advanced)

- BMED 1101 Introductory Medical Biochemistry
- BMED 1102 Introduction to Biomedical I Lab
- BMED 1103 Introductory Cell Biology
- BMED 1104 Introductory Molecular Biology
- BMED 1105 Introductory Medical Genetics
- BMED 1106 Introductory Medical Microbiology
- BMED 1107 Introductory Immunology
- BMED 1108 Introduction Medical Neuroscience
- BMED 1110 Introductory Medical Physiology
- BMED 1111 Introduction to Biomedical II Lab
- BMED 2101 Gross Anatomy
- BMED 2102 Molecules, Cells and Tissues
- BMED 3101 Pathobiology and Host Defense
- BMED 3102 Neurochemistry
- BMED 3103 Human Behavior
- BMED 3104 Integrated Body Systems I: Cardiovascular and Pulmonary
- BMED 3105 Integrated Body Systems II: Gastrointestinal
- BMED 3106 Integrated Body System III: Renal, Fluid, and Electrolytes
- BMED 3107 Integrated Body System IV: Endocrine and Reproductive System

BMED 3108 Integrated Body System V: Dermatology, Hematology, and Musculoskeletal System
BMED 3109 Medical Syndromes
BMED 4220 Medical Bioinformatics, Genomics, and Systems Biology
BMED 4230 Human Genetics and Medical Genomics
BMED 4240 Medical Microbiology
BMED 4310 Medical Biochemistry

j – Computational Engineering Physics – 30 hours (20 advanced)**i – Computational Engineering Physics – 24 hours (14 advanced)**

ENGR 2301 Engineering Mechanics I: Statics
ENGR 2302 Engineering Mechanics II: Dynamics
ENGR 2105 Linear Circuits Lab
ENGR 2305 Linear Circuits
ENGR 3304 Mechanics of Materials
ENGR 3121 Electronics I Lab

ENGR 3321 Electronics I
ENGR 4441 Control Systems
MATH 3341 Differential Equations

ii – Computational Engineering Physics – 6 hours (6 advanced).

Choose 6 hours of advanced ENGR courses.

k – Computational Engineering Technology – 30 hours (18 advanced)**i – Computational Engineering Technology Core – 21 hours (12 advanced)**

ENGT 2307 Engineering Materials I for Engineering Technology
ENGT 2310 Intro to Manufacturing Processes
ENGT 2321 Basic Electronics
ENGT 3312 Renewable Energy Technology
ENGT 3321 Solar Energy Systems
ENGT 3333 Quality Control
ENGT 4340 Robotics and Automation

ii – Computational Engineering Technology – 9 hours (6 advanced)

Choose 9 hours of ENGT courses, of which 6 hours must be advanced.

C – SUPPORT COURSES – 11 HOURS (3 advanced)

MATH 2318 Linear Algebra
MATH 2413 Calculus I (or MATH 2487 Honors) one-hour lecture
MATH 2414 Calculus II (or MATH 2488 Honors)
MATH 3331 Applied Statistics I

TOTAL CREDIT HOURS FOR GRADUATION – 120 HOURS**TOTAL ADVANCED HOURS (MINIMUM) – 48 HOURS****ADMISSION, PROGRESSION, AND GRADUATION REQUIREMENTS, if applicable:****Graduation requirements**

In addition to the graduation requirements listed in the UTRGV 2015-2017 Undergraduate Catalog, demonstration of proficiency in a language other than English is required at the undergraduate level

equivalent to a minimum of six credit hours. Proficiency can be demonstrated by a college credit exam, a placement test approved through the UTRGV Department of Writing and Language Studies, and/or up to six credit hours of college-level language coursework.