# COLLEGE OF ARTS & SCIENCES: Program Student Learning Outcomes

| College | Department | Degree, Certificate, or other Credential | Program | Specialized Accreditor | STUDENT LEARNING OUTCOMES |
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| CAS | Natural Sciences | B.S. | Bioinformatics | N/A | After completing the program, BSU Bioinformatics graduates will be able to:<br><br>1. Explain how the fundamental concepts in modern biology, chemistry, physics and mathematics, apply to biological systems at the cellular and molecular level.<br>2. Apply the principles of inheritance and genomics to biological systems.<br>3. Interpret biological, medical and "omics dimension" databases by using computational and machine learning tools and techniques.<br>4. Describe the fundaments of computation at use in modern Bioinformatics<br>5. Learn and apply the fundamental laboratory techniques used in modern chemistry, genetics, cell and molecular biology.<br>6. Demonstrate fluency in the interpretation and meaningful criticism of contemporary biological, biomedical and bioinformatics research topics as reported in the primary research literature.<br>7. Recognize the role of bioinformatics in biotechnology, medicine and pharmaceutical development, and the ethical implications of bioinformatics (and information technology) on society at large<br>8. Communicate technical material effectively to lay and scientific audiences |
| CAS | Natural Sciences | B.S. | Biology | N/A | After completing the program, BSU Biology graduates will be able to:<br>Learning Objectives for Core Concepts for Biological Literacy<br>1. Explain how phylogenetic relationships demonstrate relatedness and ancestry of living things.<br>2. Explain how species evolve over time by processes of mutation, selection, and genetic change.<br>3. Explain how basic units of structure define the function of all living things.<br>4. Explain how inherited genetic and epigenetic information influences the location, timing, and intensity of gene expression.<br>5. Explain how living things have multiple mechanisms to perceive and respond to changing environmental conditions.<br>6. Explain how the growth and behavior of organisms are activated through the expression of genetic information in context<br>7. Explain how a structure's chemical and physical characteristics influence its interactions with other structures, and therefore its function<br>8. Explain how natural selection leads to the evolution of structures that tend to increase fitness within the context of evolutionary, developmental, and environmental constraints. |

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| | | | | | 9. Explain how biological systems grow and change by processes based upon chemical transformation pathways and are governed by the laws of thermodynamics.<br>10. Explain how biological molecules, genes, cells, tissues, organs, individuals, and ecosystems interact to form complex networks where changes in one component can impact other components.<br>11. Explain how organisms have complex systems that integrate internal and external information, incorporate feedback control, and allow them to respond to changes in the environment.<br>Learning Objectives for Core Competencies and Disciplinary Practices<br>1. Apply the process of science to biological questions.<br>2. Use quantitative reasoning including basic mathematics, graphing, and statistics to analyze biological data.<br>3. Use modeling and simulation to predict, make inferences about, solve problems, and communicate scientific data.<br>4. Apply biological knowledge to problems in other STEM disciplines and multiple fields of biology.<br>5. Communicate and collaborate with others who may have diverse backgrounds, skill sets, and perspectives within and external to biological disciplines.<br>6. Use scientific reasoning to critically analyze the impact of historical, cultural, political, ethical, and technological factors on the practice and conduct of science. |
| CAS | Natural Sciences | B.S. | Chemistry | | After completing the program, BSU Chemistry graduates will be able to:<br>1. Understand major concepts, theoretical principles and experimental findings in chemistry<br>2. Master basic scientific research skills by conducting experiments, analyzing data, interpreting results and employing safe laboratory practices<br>3. Utilize chemical instrumentation and other appropriate technology for analysis<br>4. Work effectively as a member of a diverse team<br>5. Employ critical thinking and effective problem-solving techniques in the classroom and in the laboratory<br>6. Communicate effectively in both written and oral expression<br>7. Utilize appropriate library and technological tools to conduct research and evaluate scientific information |
| CAS | Communications | B.A./B.S. | Communications | N/A | Students will:<br>1. Understand and apply the principles and laws of freedom of speech and press for the country in which the institution that houses ACEJMC is located, as well as receive instruction in and understand the range of systems of freedom of expression around the world, including the right to dissent, to monitor and criticize power, and to assemble and petition for redress of grievances<br>2. Demonstrate an understanding of the history and role of professionals and institutions in shaping communications<br>3. Demonstrate an understanding of gender, race ethnicity, sexual orientation and, as appropriate, other forms of diversity in domestic society in relation to mass communications |

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| | | | | | 4. Demonstrate an understanding of the diversity of peoples and cultures and of the significance and impact of mass communications in a global society<br>5. Understand concepts and apply theories in the use and presentation of images and information<br>6. Demonstrate an understanding of professional ethical principles and work ethically in pursuit of truth, accuracy, fairness and diversity<br>7. Think critically, creatively and independently<br>8. Conduct research and evaluate information by methods appropriate to the communications professions in which they work<br>9. Write correctly and clearly in forms and styles appropriate for the communications professions, audiences and purposes they serve<br>10. Critically evaluate their own work and that of others for accuracy and fairness, clarity, appropriate style and grammatical correctness<br>11. Apply basic numerical and statistical concepts<br>12. Apply tools and technologies appropriate for the communications professions in which they work. |
| CAS | Department of Computer Science | B.S. | Computer Science | ABET www.abet.org | Students will be able to:<br>1. Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.<br>2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.<br>3. Communicate effectively in a variety of professional contexts.<br>4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.<br>5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.<br>6. Apply computer science theory and software development fundamentals to produce computing-based solutions. |
| CAS | Department of Technology and Security | B.S. | Computer Technology | ABET www.abet.org | Candidates will demonstrate:<br><br>1. Apply knowledge of computing and mathematics appropriate to the discipline<br>2. Analyze a problem, identify and define the computing requirements appropriate to its solution<br>3. Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs<br>4. Function effectively on teams to accomplish a common goal<br>5. Understanding of professional, ethical, legal, security and societal issues and responsibilities<br>6. Communicate effectively with a range of audiences<br>7. Analyze the local and global impact of computing on individuals, organizations, and society<br>8. Recognition of the need for and an ability to engage in continuing professional development<br>9. Use current techniques, skills and tools necessary for computing practice |

| CAS | Language, Literature, and Cultural Studies | B.A. | English | N/A | Candidates will be able to…<br><br>a. Demonstrate knowledge of major literary genres/modes of inquiry.<br>b. Identify and articulate dominant literary themes/genres of the periods covered.<br>c. Show working knowledge of major authors/works from its beginnings through mid-19$^{th}$ century<br>d. Shows working knowledge of literature through the modern period.<br>e. Synthesize ideas by clear, succinct, oral/written expression.<br>f. Apply key literary terms/analytical techniques to works covered and other literary works.<br>g. Independently interpret literature in/of itself and its wider implications.<br>h. Research literary topics using electronic and traditional methods.<br>i. Understand basic literary themes, techniques, and terminology.<br>j. Appreciate cultural pluralism through investigation of literature of cultural/ historical "other". |
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| CAS | Fine & Performing Arts | B.A. | Fine Arts | N/A | Candidates will demonstrate:<br>- a strong foundation in visual and performing arts, research, technology, performance and exhibition.<br>- the tangible skills needed to produce art, while building the critical thinking skills to become creative problem solvers.<br>- an understanding of the connection between the fine and performing arts and other fields of learning.<br>- an understanding of the histories, aesthetic standards and ethical values of art as an aspect of human culture.<br><br>*(please note that the Art, Music, and Music Technology concentrations each have very detailed student learning outcomes specific to their respective fields)* |
| CAS | History & Government | B.A./B.S. | History and Government | N/A | Students will be able to:<br>1. Define the key concepts, approaches, and theories of within the field of political science.<br>2. Acquire knowledge of the primary political institutions and actors who operate in the United States.<br>3. Articulate and critically analyze classical and contemporary political theories, as well as salient issues of political thought.<br>4. Empirically analyze the political-economic development of states and non-state-actors, as well as their interaction on a global level.<br>5. Students will demonstrate proficiency in the quantitative and qualitative methods of Political Science by writing a research paper, or senior thesis.<br>6. Articulate the main currents of change regarding historical events and time periods in a variety of geographic areas. |

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| | | | | | 7. Comprehend the methodologies and techniques of the historians.<br>8. Engage in critical thinking and abstract reasoning skills through the examination of historical events, problems, and time periods.<br>9. Demonstrate a general comprehension of the philosophy of history in the distinction of various schools of historical thought.<br>10. Master the craft of the historian through the successful completion of the senior capstone courses—comprehensive exam and thesis. |
| CAS | Mathematics | B.S. | Mathematics | N/A | The student learning objectives/outcomes are to:<br><br>• Demonstrate acquired skills in Calculus of several variables, vector analysis, basic linear algebra, and elements of vector spaces.<br><br>• Illustrate mathematical reasoning and logical deduction reasoning.<br><br>• Formulate mathematical definitions<br><br>• Recite main mathematical theorems<br><br>• Differentiate between the methods of direct proof and indirect proofs and apply these methods to solving problems<br><br>• Communicate the overall process by detailing the steps necessary in solving a mathematical problem<br><br>• Develop a deep understanding that allows rigorous application of various methods in real analysis and modern algebra. |
| CAS | Fine & Performing Arts | B.S. | Theatre Arts | N/A | Throughout the program of study and upon graduation, student should demonstrate the ability to:<br>1. analyze a variety of performance and dramatic texts<br>2. synthesize and clearly articulate the collaborative work of theatre arts by connecting its<br> a. history<br> b. theories<br> c. performance elements<br> d. production processes<br> e. dramatic literature<br> f. technical areas (i.e., design, build, lighting, sound, dramaturgy)<br> g. use of technology |

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| | | | | | 3. effectively utilize voice and body as an instrument of performance<br><br>4. market self in the business of theatre and dance<br>5. communicate orally and graphically the universality of theater and dance as global and cultural expressions of humans. |
| CAS | Fine & Performing Arts | B.S. | VCDMA | N/A | Candidates will demonstrate:<br><br>- the application of key principles of art and design, animation, cinema and fashion design in their work.<br>- an understanding of the artists, innovators, filmmakers and designers who have contributed to design, technology, entertainment and media arts.<br>- the ability to conduct collaborative research to broaden technical expertise in the visual and media arts.<br>- both the ability to explore art and self-expression to enhance cultural and artistic growth and an appreciate of culture and diversity.<br><br>*(please note that the Advertising Design, Animation & Motion Graphics, Digital Cinema & Time-Based Media, Digital Media Arts, and Fashion Design concentrations each have very detailed student learning outcomes specific to their respective fields)* |
| CAS | Math | M.S. | Applied Mathematics | N/A | Students will:<br>- Demonstrate proficiency across core disciplines through the requirements of the core courses.<br>- Apply different computational techniques in the study of applied mathematics.<br>- Demonstrate proficiency in the of concentration through completing electives.<br>- Conduct research or produce some other form of creative work<br>- Communicate mathematical ideas, results, context, and background effectively and professionally in written and oral form. |
| CAS | Computer Science | M.S. | Computer Science | N/A | The student learning objectives are to:<br>1. Expand a student's knowledge base in cutting-edge applications, processes, and tools used in the computer science discipline.<br>2. Enable a student who holds an undergraduate degree to retool their education in order to seek a new career in a STEM related discipline.<br>3. Enhance a student's earning potential through the completion of an advanced degree. |

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| CAS | **Language, Literature, and Cultural Studies** | **M.A.** | **English** | **N/A** | Candidates will be able to… <br><br> a. Conduct complex research projects and develop sophisticated written and oral arguments for a variety of audiences and professional contexts. <br> b. Write essays of varying lengths and for various audiences that demonstrate an understanding of culture and its relationship to different texts; the characteristics of genres, their conventional uses, and the possibilities for experimentation; the major schools of cultural criticism and literary theory; and the interplay of literature, identity, and socioeconomic, cultural, and historical movements and trends. <br> c. Prepare presentations, media content, and teaching materials that demonstrate the characteristics listed above. <br> d. Students will be able to demonstrate their understanding of new technologies through participation in digital humanities and social media-based projects. <br> e. Serve as effective and knowledgeable teaching assistant in first-year writing courses. |
| CAS | **Communications** | **M.A.** | **Organizational Communications** | **N/A** | Students will: <br> • Understand and apply the principles and laws of freedom of speech and press for the country in which the institution that houses ACEJMC is located, as well as receive instruction in and understand the range of systems of freedom of expression around the world, including the right to dissent, to monitor and criticize power, and to assemble and petition for redress of grievances <br> • Demonstrate an understanding of the history and role of professionals and institutions in shaping communications <br> • Demonstrate an understanding of gender, race ethnicity, sexual orientation and, as appropriate, other forms of diversity in domestic society in relation to mass communications <br> • Demonstrate an understanding of the diversity of peoples and cultures and of the significance and impact of mass communications in a global society <br> • Understand concepts and apply theories in the use and presentation of images and information <br> • Demonstrate an understanding of professional ethical principles and work ethically in pursuit of truth, accuracy, fairness and diversity <br> • Think critically, creatively and independently <br> • Conduct research and evaluate information by methods appropriate to the communications professions in which they work <br> • Write correctly and clearly in forms and styles appropriate for the communications professions, audiences and purposes they serve <br> • Critically evaluate their own work and that of others for accuracy and fairness, clarity, appropriate style and grammatical correctness |

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| | | | | | • Apply basic numerical and statistical concepts<br>• Apply tools and technologies appropriate for the communications professions in which they work. |
| CAS | Department of Computer Science | D.Sc. | Computer Science | N/A | The student learning objectives are:<br>1. To prepare students to conduct research and become leaders in computer science/technology,<br>2. To develop advanced educational skills to meet the demands of high-tech job markets, and<br>3. To develop students' in-depth knowledge of current computer science and technological research methods, processes, and tools in order to enable them to conduct high quality research and provide expert instruction at the undergraduate and graduate levels. |