Support for University and College Missions

Marshall University is a multi-campus public university providing innovative undergraduate and graduate education that contributes to the development of society and the individual. The University actively facilitates learning through the preservation, discovery, synthesis, and dissemination of knowledge.

— University Mission

Programs must state their Program Mission and specify how this mission supports both the University's Mission as well as any Mission that the College the Program is housed under happens to have.

College Mission

Scientific and technologically trained people are essential to our nation's health and prosperity in a rapidly expanding global economy. Students majoring in baccalaureate degree programs in the College of Science receive a broad education conducive to pursuing a wide range of career options. Course requirements include solid grounding in the student’s chosen area of scientific interest along with studies in humanities and the social students receive instruction in a learning environment that encourages competency in written and oral communication skills along with the ability to work in groups. Special emphasis is placed on experiential learning through participation in activities such as undergraduate research and internships. For non-science majors, departments in the College of Science offer a series of courses which focus on enhancing science literacy through instruction in integrated science and practical applications of mathematics.

Program Mission

The primary mission of the Integrated Science and Technology department is to offer students a degree program with a curriculum that combines knowledge of scientific principles with the use of advanced technology. The approach to teaching and learning gives students opportunities for growth that they might not find in a more traditional program. A secondary mission is economic development of our region through producing graduates who can use the knowledge they’ve acquired in real-life situations and will be ready to make a contribution in the workplace with or without an advanced degree.

Support for College Mission

The Integrated Science and Technology Department utilizes hands-on, project-based, technologically oriented, educational components to provide both undergraduate and graduate students with interdisciplinary education through a multidisciplinary approach that prepares them for science and technology career opportunities. Courses that have been designated within the IST core set of courses integrate science and technology, bringing the bond between the two areas into perspective for students. Courses within a student’s major field of study (outside the core) delve deep into modern issues in science and/or technology, educating students on how to communicate effectively, perform research outside of the classroom, and contribute to the global body of scientific and technical knowledge.
Support for University Mission

Integrated Science and Technology contributes to the university mission by promoting student learning and retention and fostering academic success. The department promotes economic development through student preparation for work in high tech fields in the state and beyond while building technological innovations of the future. Courses prepare students to live and work in the rapidly changing global environment made possible by science and technology. Faculty stay current in their fields, incorporate innovative teaching methods, actively mentor students in courses and research, and assist career preparations while regularly reviewing and updating the curriculum and degrees to meet the needs of students, WV, and the region. Through our courses, students are taught how to think critically while being presented with the in-depth knowledge necessary to be able to contribute scientific and technical expertise to the community, and professionally through career paths in their field of study.
Learning Outcomes

Given real world problems, students will be able to choose the most appropriate combination of technologies, tools, and/or methods to solve those problems.

<table>
<thead>
<tr>
<th>Assessment Point 1</th>
<th>Embedded Assessment</th>
<th>Expected Benchmark Level</th>
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</thead>
<tbody>
<tr>
<td>IST130, IST260</td>
<td>Exam in both courses.</td>
<td>Introductory</td>
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<table>
<thead>
<tr>
<th>Assessment Point 2</th>
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<tbody>
<tr>
<td>IST490</td>
<td>Ability to choose, plan, develop, test, and present a capstone project in their discipline through an internship, project, or research paper.</td>
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Students will be able to analyze the potential consequences of the choices they make to solve problems in their discipline.

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Students will be able to plan and execute a project (individualized toward their career goals) at a professional level using discipline-specific knowledge.

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<tr>
<td>IST111, IST130</td>
<td>Exam in IST111, lab assignment in IST130</td>
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In the design and development of a discipline-related project, students will demonstrate Critical Thinking and Creativity where appropriate when identifying issues and applying the most pragmatic scientific and/or technical methods.

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<tr>
<td>IST130, IST120, IST111, IST260</td>
<td>IST130 – Lab experiment IST120 – Research paper with presentation IST111 – Lab experiment and exam IST260 – Integrated Lab</td>
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In the development of discipline-related projects, students will scientifically analyze data, derive solutions, and appropriately evaluate results.

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<td>IST111 – Final Exam IST130 – Final Exam IST260 – Final Exam</td>
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Students will be effective communicators in relating findings and recommendations resulting from discipline-related projects.

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<td>Defines and explains the boundaries, divisions, styles and practices of the field.</td>
<td>Identifies the appropriate tool or technology to use to solve a problem.</td>
<td>Applies an existing tool or technology to the solution of a problem within their field.</td>
<td>Combines existing technologies and or tools with their own original discoveries to apply toward the solution to a problem, whether in their field or not.</td>
<td></td>
</tr>
<tr>
<td>Demonstrates fluency in the use of tools, technologies and methods in the field.</td>
<td>Navigates menus and functions with spreadsheet and database applications.</td>
<td>Uses spreadsheet and database applications to create solutions to problems related to their major field of study.</td>
<td>Creates a spreadsheet and/or database solution which can be used to synthesize data from any discipline.</td>
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</tr>
<tr>
<td>Constructs a summative project, paper or practice-based performance that draws on current research, scholarship and/or techniques in the field.</td>
<td>Identifies appropriate research areas and techniques applied to problems in their major of study.</td>
<td>Creates an original project or paper and appropriately links current research and scholarship to a problem formulated in class.</td>
<td>Applies current research to a real-world problem that has no solution and proposes a method on how to apply current techniques to arrive at a solution.</td>
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<tr>
<td>Translates verbal problems into mathematical algorithms, constructs valid arguments using the accepted symbolic system of mathematical reasoning, and constructs accurate calculations, estimates, risk analyses or quantitative evaluations of public informat</td>
<td>Identifies the appropriate mathematical algorithm that needs to be applied to a problem.</td>
<td>Applies the appropriate mathematical algorithm to a problem and achieves accurate results after working through the problem.</td>
<td>Extends a problem to introduce factors of risk, and analyzes the impact that applying particular algorithms can have on the outcomes to problems in their field.</td>
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Students will be able to analyze the potential consequences of the choices they make to solve problems in their discipline.

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<td>Constructs a cultural, political or technological alternate vision of either the natural or human world through a written project, laboratory report, exhibit, performance or community service design; defines the distinct patterns in this alternate vision;</td>
<td>Identifies existing works that provide varying perspectives on cultural, political, or technological vision of the natural or human world.</td>
<td>Creates an original work bringing together references from diverse resources on cultural, political, or technological vision of the natural or human world.</td>
<td>Relates diverging perspectives and incorporates their own view (either dissenting or assenting), but backed up with scientific evidence.</td>
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</tr>
<tr>
<td>Differentiates and evaluates theories and approaches to complex standard and non-standard problems within his or her major field. (Analytic inquiry)</td>
<td>Identifies existing theories or algorithms that exist to approach scientific problems.</td>
<td>Identifies the appropriate theory or algorithm to approach a particular problem within their field.</td>
<td>Applies the appropriate theoretical approach or algorithm to either a complex standard or non-standard problem to generate a solution.</td>
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Students will be able to plan and execute a project (individualized toward their career goals) at a professional level using discipline-specific knowledge.

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<td>Produces, independently or collaboratively, an investigative, creative or practical work that draws on specific theories, tools and methods from at least two academic fields.</td>
<td>Creates a work using two fields based on exact steps found in existing examples</td>
<td>Creates an original work through group collaboration based on theories and tools that exist, but integrates more than one discipline</td>
<td>Develops independently a new work based on existing theories but without practical examples.</td>
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</tr>
<tr>
<td>Evaluates, clarifies and frames a complex question or challenge using perspectives and scholarship from the student’s major field and at least one other.</td>
<td>States an original question, but without basis of the underlying background information</td>
<td>Relates an original question with integration of two or more fields, after performing research of the underlying principles</td>
<td>Evaluates, correlates, and frames questions from more than one academic field on potential new integration of knowledge.</td>
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<tr>
<td>Defines and properly uses the principal terms in the field, both historical and contemporaneous.</td>
<td>Recall terms and their definition.</td>
<td>Demonstrate use of terms from major in appropriate context.</td>
<td>Integrates terms from multiple disciplines into a document with the appropriate context.</td>
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In the design and development of a discipline-related project, students will demonstrate Critical Thinking and Creativity where appropriate when identifying issues and applying the most pragmatic scientific and/or technical methods.

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<td>Formulates a question on a topic that addresses more than one academic discipline or practical setting, locates appropriate evidence that addresses the question, evaluates the evidence in relation to the problem’s contexts, and articulates conclusions that</td>
<td>Identifies a question relevant to the integration of multiple disciplines relating to science and technology.</td>
<td>Formulates a question and proposes a solution for an issue that relates to the integration of multiple disciplines.</td>
<td>Performs research and solves an issue that integrates multiple disciplines while articulating their conclusions that follow logically from problem analysis.</td>
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<td>Presents a project, paper, performance or other appropriate task linking knowledge and skills from work, community or research activities with knowledge acquired in academic disciplines; explains how elements were combined to shape meaning or findings; an</td>
<td>Presents a project or paper related to something covered in class.</td>
<td>Presents a project or paper linking - knowledge gained from a course to a real world science or technology issue.</td>
<td>Presents a paper or project linking knowledge gained from a course to a real world science or technology issue, and provides a proposed solution to the issue.</td>
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<tr>
<td>Completes a field-based assignment in the course of study that employs insights from others; evaluates a significant question in relation to concepts, methods or assumptions in at least one academic field; and explains the implications of learning outside</td>
<td>Explains a real-world problem using terminology gained from specialized knowledge covered in class.</td>
<td>Creates an algorithm applying prior solutions to related problems to a new problem introduced to a class from an outside resource.</td>
<td>Creates a new body of work while demonstrating critical thinking and creativity that employs an algorithm that the student developed to solve a problem that was earlier introduced to a class from an outside resource.</td>
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<td>Collaborates in developing and implementing an approach to a civic issue, evaluates the process and, where applicable, weighs the result.</td>
<td>Identifies a problem in collaboration with others that exists in the world that could possibly be solved with the skills learned in their major field of study.</td>
<td>Proposes a solution to a real world problem in consultation with a small team.</td>
<td>Creates and evaluates the solution to a real-world problem through a team-based approach.</td>
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<tr>
<td>Develops and justifies a position on a public issue and relates this position to alternative views within the community or policy environment.</td>
<td>Identifies a community or policy issue that relates to science or technology.</td>
<td>Defines a community or policy issue that can be solved by applying the knowledge obtained in a course.</td>
<td>Develops a solution to a community or policy issue by applying knowledge obtained through coursework.</td>
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<tr>
<td>Frames a complex scientific, social, technological, economic or aesthetic challenge or problem from the perspectives and literature of at least two academic fields and propose a short</td>
<td>Identifies a scientific, social, technological, economic or aesthetic challenge or problem from literature that spans</td>
<td>Create an original paper or work that illustrates a scientific, social, technological, economic or aesthetic challenge or problem</td>
<td>Propose a solution to a scientific, social, technological, economic or aesthetic challenge or problem</td>
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<td>and proposes a &quot;best approach&quot; to the question or challenge using evidence from those field</td>
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<td>Explains a problem in science, the arts, society, human services, economic life or technology from the perspective of at least two academic fields, explains how the methods of inquiry and research in those disciplines can be brought to bear, judges the ii</td>
<td>Identifies a problem in science or technology that can be viewed from multiple disciplines.</td>
<td>Create an original paper or work that illustrates a problem in science or technology spanning multiple disciplines.</td>
<td>Propose a change to a problem in science or technology that spans multiple disciplines, and provide justification and risk analysis for the proposed change.</td>
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<td>Defines and explains the boundaries, divisions, styles and practices of the field.</td>
<td>Identifies key terminology related to their major field of study.</td>
<td>Define the differences between their major field of study and related fields in science and/or technology.</td>
<td>Present the differences between their major field of study and related fields while proposing a new focus area for their major field of study.</td>
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<td>Constructs a summative project, paper or practice-based performance that draws on current research, scholarship and/or techniques in the field.</td>
<td>Identifies an area for research to expand the body of knowledge in their major field of study.</td>
<td>Creates an original work that summarizes current research in their major field of study.</td>
<td>Creates an original work that suggests changes and new directions for current research in their major field of study.</td>
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<td>Constructs a cultural, political or technological alternate vision of either the natural or human world through a written project, laboratory report, exhibit, performance or community service design; defines the distinct patterns in this alternate vision;</td>
<td>Identifies a problem from the natural or human world, which could be modeled using science or technology.</td>
<td>Develops a full project plan for the implementation of a scientific or technological model or simulation for something that exists within the natural or human world.</td>
<td>Implements a scientific or technological model or simulation for something that exists within the natural or human world while describing their vision for the development.</td>
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<td>Incorporates multiple information resources in different media or languages in projects, papers or performances, with appropriate citations; and evaluates the relative merits of competing resources with respect to clearly articulated standards. (Use of in</td>
<td>Identifies different technologies that can be used to develop a particularly assigned project.</td>
<td>Develops a new, original project using multiple information resources appropriately.</td>
<td>Produces a large-scale project which incorporates multiple technologies appropriately to create a new, original work.</td>
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<td>Analyze a topic in more than one academic discipline or practical setting.</td>
<td>Identify and evaluate appropriate evidence related to a topic.</td>
<td>Articulate conclusions, which logically follow from the analysis and evidence gathered related to a problem across disciplines.</td>
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<td>Demonstrates fluency in the use of tools, technologies and methods in the field.</td>
<td>Recognizes available tools, technologies and methods that are available to them.</td>
<td>Applies some of the available tools, technologies and methods to a given project in their field of study.</td>
<td>Synthesizes information from multiple tools, technologies, and methods while achieving a solution to a problem in field.</td>
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<td>Produces, independently or collaboratively, an investigative, creative or practical work that draws on specific theories, tools and methods from at least two academic fields.</td>
<td>Creates a work using two fields based on precise steps found in existing examples.</td>
<td>Creates an original work independently or through group collaboration based on theories and tools that exist, but integrates more than one discipline.</td>
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<td>Defines and properly uses the principal terms in the field, both historical and contemporaneous.</td>
<td>Elicits principle terms and their definitions.</td>
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<td>Constructs sustained, coherent argument or presentation on technical issues or processes in more than one medium for general and specific audiences; and works through collaboration to address a social, personal or ethical dilemma</td>
<td>Illustrates coherent information with multiple media</td>
<td>Relates information with multiple media, as well as through collaboration to address specific issues</td>
<td>Assemble theories and hypotheses through presentation of coherent information, asking scientific questions, expanding current research through collaboration</td>
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<td>Presents a project, paper, performance or other appropriate task linking knowledge and skills from work, community or research activities with knowledge acquired in academic disciplines; explains how elements were combined to shape meaning or findings; an</td>
<td>Illustrates a project or paper and explain basics of why project or paper was created</td>
<td>Implement the presentation of a project or paper and explain not only the basics of why the paper was created, but also what the creation of such deliverable means and how it was created</td>
<td>Synthesizes existing data to create and present a theoretical project or paper showing integrated relationships of knowledge</td>
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<td>Explains diverse perspectives on a contested issue and evaluates insights gained from different kinds of evidence reflecting scholarly and community perspectives.</td>
<td>Identifies and expresses the fact that the issues at hand is a contested issue</td>
<td>Identifies a contested issue and able to synthesize the arguments of those involved in all sides</td>
<td>Identifies potential conflicts that may result from studying the integration of existing knowledge</td>
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