

Extended Reality (XR) Courses/ Certificates Mississippi Curriculum Framework

Same CIP as IST 11.0201 Computer Programming/ Programmer, General

Same CIP as IST 11.0202 Computer Programming, Specific Applications.

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The Office of Curriculum and Instruction (OCI) was founded in 2013 under the Division of Workforce, Career, and Technical Education at the Mississippi Community College Board (MCCB). The office is funded through a partnership with The Mississippi Department of Education (MDE), who serves as Mississippi's fiscal agent for state and federal Career and Technical Education (CTE) Funds. The OCI is tasked with developing statewide CTE curriculum, programming, and professional development designed to meet the local and statewide economic demand.

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ADOPTION OF NATIONAL CERTIFICATION STANDARDS

A national certification was not identified at the curriculum writing meeting. The Mississippi Community College Board office of Curriculum and Assessment will work with colleges and industry to determine a national certification.

INDUSTRY JOB PROJECTION DATA

The Virtual Reality occupation requires a Bachelor's Degree. There is expected to be a 27.38% increase. At the state annual income for this occupation is \$75,213.43 at the state level. A summary of occupational data from the State Workforce Investment Board Data Center is displayed below:

Table 1: Education Level

Program Occupations	Education Level
Computer Programmers	Bachelor's Degree
Software Developers, Application	Bachelor's Degree

Table 2: Occupational Overview

	Region	State	United States
2016 Occupational Jobs	4,006	4,006	1,091,228
2026 Occupational Jobs	5,103	5,103	1,654,209
Total Change	1,097	1,097	562,981
Total % Change	27.38%	27.38%	51.59%
2016 Median Hourly Earnings	\$36.16	\$36.16	\$43.13
2016 Median Annual Earnings	\$75,213.43	\$75,213.43	\$89,710.93
Annual Openings	110	110	56,298

Table 3: Occupational Breakdown

Description	2016 Jobs	2020 Jobs	Annual Openings
Computer Programmers	961	948	-1
Software Developers, Application	3,045	4,155	111
TOTAL	4,006	5,103	110

Table 4: Occupational Change

Description	Regional Change	Regional % Change	State % Change
Computer Programmers	-13	-1.35%	-1.35%
Software Developers, Application	1,110	36.45%	36.45%

ARTICULATION

There is no identifiable articulation pathway at this time. As the secondary program is updated in the future, the curriculum will be reviewed for possible articulation.

TECHNICAL SKILLS ASSESSMENT

Colleges should report the following for students who complete the program with a career certificate, technical certificate, or an Associate of Applied Science Degrees for technical skills attainment. To use the approved Alternate Assessment for the following programs of study, colleges should provide a Letter of Notification to the Director of Career Technical Education at the MS Community College Board. Please see the following link for further instructions: <http://www.mccb.edu/wkfEdu/CTDefault.aspx>.

CIP Code	Program of Study	
11.0201	Extended Reality (XR)	
Level	Standard Assessment	Alternate Assessment
Technical/AAS		

A national certification was not identified at the curriculum writing meeting. The Mississippi Community College Board office of Curriculum and Assessment will work with colleges and industry to determine a national certification.

RESEARCH ABSTRACT

In the spring of 2019, the Office of Curriculum and Instruction (OCI) met with the Lobaki industry members who made up the advisory committees for the Extended Reality (XR) curriculum framework. An industry questionnaire was used to gather feedback concerning the trends and needs, both current and future, of their field. Program faculty, administrators, and industry members were consulted regarding industry workforce needs and trends. Industry advisory team members from the college involved with this program were asked to give input related to changes to be made to the curriculum framework. Specific comments related to soft skills discussed include communication, skill, grammar skills, evidence of the ability to learn, must be adaptable, and a well-rounded employee. Occupation-specific skills discussed include a basic understanding of SQL, ERP experience, CompTIA Network+, CompTIA A+, IT Technician and CompTIA Security+ Certification or Microsoft certifications.

During the writing team meeting, colleges and industry decided that there was a need for a work ready and technical certificate only at this time. Student deciding to obtain the technical certificate in extended reality would need to successfully complete the Information Systems Programming Career Certificate

REVISION HISTORY:

2019 Mississippi Community College Board

PROGRAM DESCRIPTION

Extended Reality Program

The Extended Reality program will introduce Extended Reality (XR). The courses will prepare students for the basics of XR, hardware, history of XR, different applications of XR, psychology of Extended Reality, and the challenges of the medium. The XR program offers a Career Ready certificate and Technical certificate.

The courses are designed for students who are new to XR as a medium. You may have experienced some virtual reality before and may have some hardware, but these courses are suitable to individuals who have never experienced XR.

A learner with no previous experience in Extended Reality and/or game programming will be able to evaluate existing XR applications, design, test, and implement their own XR experiences/games.

SUGGESTED COURSE SEQUENCE

Career Ready Certificate Extended Reality (XR) Development

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
IST2854	Extended Reality (XR) Digital Artistry	4	3 2	2 4	75 90			
IST 2824	Extended Reality (XR) 3D Modeling	4	3 2	2 4	75 90			
IST 2834	Extended Reality (XR) Development	4	3 2	2 4	75 90			
IST 2844	Extended Reality (XR) Project Design	4	3 2	2 4	75 90			
	Total	16			300-360			

Technical Certificate Extended Reality (XR) Development

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
IST 2824	Extended Reality (XR) 3D Modeling	4	3 2	2 4	75 90			
IST 2834	Extended Reality (XR) Development	4	3 2	2 4	75 90			
IST 2844	Extended Reality (XR) Project Design	4	3 2	2 4	75 90			
	Technical Elective	3						
	Total	15			225-270			

General Education Core Courses

To receive the Associate of Applied Science degree, a student must complete all of the required coursework found in the Career Certificate option, Technical certificate option, and a minimum of 15 semester hours of General Education core. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester or provided primarily within the last semester. Each community college will specify the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science degree at their college. The Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) Section 9 Standard 3 of the *Principles of Accreditation: Foundations for Quality Enhancement*¹ describes the general education core.

Section 9 Standard 3:

3. The institution requires the successful completion of a general education component at the undergraduate level that
 - a) is based on a coherent rationale.
 - b) is a substantial component of each undergraduate degree program. For degree completion in associate programs, the component constitutes a minimum of 15 semester hours of the equivalent; for baccalaureate programs, a minimum of 30 semester hours or the equivalent.
 - c) ensures breadth of knowledge. These credit hours include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics. These courses do not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession.

<<<Add any additional general education standards as required for programmatic accreditation here and footnote below.>>>

General Education Courses

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
	Humanities/Fine Arts	3						
	Social/Behavioral Sciences	3						
	Math/Science	3						
	Academic electives	6						
	TOTAL	15						

¹ Southern Association of Colleges and Schools Commission on Colleges. (2017). *The Principles of Accreditation: Foundations for Quality Enhancement*. Retrieved from <http://www.sacscoc.org/2017ProposedPrinc/Proposed%20Principles%20Adopted%20by%20BOT.pdf>

INFORMATION SYSTEM ELECTIVE COURSES

Course Number	Course Name	Semester Credit Hours
	Instructor Approved Electives	
	Per Local Community College	
	Total	

EXTENDED REALITY COURSES (XR):

Course Number and Name: IST 2824 Extended Reality (XR) 3D Modeling

Description: This course provides an introduction to 3D content creation using design visualization software with emphasis on the connection to the creative thought process. Students will learn an overview of the workflow relating to animation, modeling, texturing, lighting, and rendering.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
4	3	2	75
4	2	4	90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Demonstrate an understanding of 3D Modeling software.
 - a. Discuss types of visualization software.
 - b. Identify fundamental terminology for building 3D models.
2. Design an interface using 3D Modeling tools.
 - a. Create objects using visualization software.
 - b. Understand object components.
 - c. Utilize texturing tools and lighting.
 - d. Review basic camera and rendering options.

Course Number and Name: IST 2834 Extended Reality (XR) Development

Description: This course is designed to introduce students to extended reality development as it relates to various industries. This course will provide students an understanding of the tools and skill sets necessary to develop extended reality experiences.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
4	3	2	75
4	2	4	90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Explain the history of Extended Reality (XR) and the various roles and tools utilized in the industry.
2. Define a game engine and identify the available options for extended reality development.
 - a. Identify and compare game engine options for extended reality productions.
 - b. Discuss the tools available for content creation within XR platforms.
 - c. Discuss the resources available for learning, inspiration, and free asset acquisition.
3. Explain the elements and life cycle of extended reality experience design.
4. Demonstrate an understanding of the key components of extended reality experience design within a game engine.
 - a. Understand project anatomy and creation.
 - b. Demonstrate ability to work with assets within a project.
 - c. Utilize lighting and rendering techniques.
 - d. Build landscapes and worlds.
 - e. Demonstrate knowledge of audio asset management and usage.
 - f. Display knowledge of animation and particle effects creation.

Course Number and Name: IST 2844 Extended Reality (XR) Project Design

Description: This course is designed to immerse students into the creation process for multiple types of extended reality experiences. Students will gain an understanding of the complete design process of an extended reality experience, and the team effort required to create quality immersive experiences. Students will also develop a portfolio of entry-level work.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
4	3	2	75
4	2	4	90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Design an extended reality experience concept.
 - a. Create Game Design and Pitch documents.
 - b. Utilize the Feature Matrix.
 - c. Demonstrate an understanding of the Art Bible.
 - d. Discuss the Art and Productions budgets.
2. Create a virtual reality environment based on an inspirational source.
 - a. Demonstrate an understanding of level design fundamentals.
 - b. Develop a game, simulation, or extended reality experience concept.
 - c. Create a game design document, concept art, and supporting documentation.
3. Create an XR experience.
4. Create a portfolio.

Course Number and Name: IST 2854 Extended Reality (XR) Digital Artistry

Description: This course is designed to provide an introduction to the tools required to create and edit graphic images

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
4	3	2	75
4	2	4	90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Demonstrate knowledge of image composition and elements of visual design through photography.
 - a. Apply art elements and principles, such as composition, color, value, and symmetry to photographic works of art in both analog and digital media.
 - b. Use photo and video editing software to manipulate and enhance images for use in visual design software and meet hardware specifications.

Course Number and Name: IST 2864 Extended Reality (XR) Illustration and Rendering

Description: This course is designed to provide an introduction to the tools used in visual design and illustration software.

Hour Breakdown:

4

Semester Credit Hours	Lecture	Lab	Contact Hours
4	3	2	75
4	2	4	90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Demonstrate knowledge of artistic rendering and illustration.
 - a. Discuss elements of visual design.
 - b. Utilize methods of drawing utilized in digital and graphic design.
 - c. Use illustration software for illustration and artistic rendering.

Course Number and Name: IST 2874 Extended Reality (XR) Animation

Description: This course is designed to introduce students to extended reality animation.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
4	3	2	75
4	2	4	90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Utilize software for animation and textures.
 - a. Demonstrate animation techniques.
 - b. Demonstrate examples of particle effects.
 - c. Demonstrate examples of texture.
 - d. Demonstrate examples of character creation
 - e. Demonstrate design of scenes and props.

Appendix A: RECOMMENDED TOOLS AND EQUIPMENT

CAPITALIZED ITEMS

Virtual Reality Production Computer (1 per student)

NON-CAPITALIZED ITEMS

Virtual Reality Headset (1 per student)

Headphone (1 pair per student)

RECOMMENDED INSTRUCTIONAL AIDS

Projector

Appendix B: Curriculum Definitions and Terms

- Course Name – A common name that will be used by all community colleges in reporting students
- Course Abbreviation – A common abbreviation that will be used by all community and junior colleges in reporting students
- Classification – Courses may be classified as the following:
 - Career Certificate Required Course – A required course for all students completing a career certificate.
 - Technical Certificate Required Course – A required course for all students completing a technical certificate.
 - Technical Elective – Elective courses that are available for colleges to offer to students.
- Description – A short narrative that includes the major purpose(s) of the course
- Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course
- Corequisites – A listing of courses that may be taken while enrolled in the course
- Student Learning Outcomes – A listing of the student outcomes (major concepts and performances) that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
 - Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
 - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
 - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
 - Activities that include integration of academic and career–technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary career–technical programs
 - Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas
- Sequencing of the course within a program is left to the discretion of the local college. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors. Programs that offer an Associate of Applied Science Degree must include all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.

- In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:
 - Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework
 - Revising or extending the student learning outcomes
 - Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)

Appendix C: Textbook List

Recommended Extended Reality Text Book List CIP: 11.0201- Virtual Reality		
Book Title	Author (s)	ISBN
Dawn of the New Everything	Jaron Lanier	13:978-1627794091 10: 1627794093
The VR Book: Human-Centered Design for Virtual Reality	Jason Jerald	13: 978-1970001129 10: 1970001127
Storytelling for Virtual Reality	John Bucher	13: 978-1138629660 10: 1138629669
The Art of Game Design: A Book of Lenses	Jesse Schell	13: 978-1466598645 10: 9781466598645