STATE BOARD OF COMMUNITY COLLEGES

CURRICULUM PROGRAM APPLICATION
(New to the System)

The State Board of Community Colleges is asked to approve the curriculum program at the listed college on the condition that equipment funds are available to the college and operating funds generated by the budget formula will permit the offering of these programs without any special allocation of funds.

Asheville-Buncombe Technical Community College
Brewing, Distillation, and Fermentation (A15xxx)

Blue Ridge Community College
Brewing, Distillation, and Fermentation (A15xxx)

Rockingham Community College
Brewing, Distillation, and Fermentation (A15xxx)

The proposed, new program has three pathways (Specialty Agriculture for Fermentation; Brewing Production, Marketing and Management; and Brewing Equipment, Packaging and Maintenance) which provide a distinct focus for each college.

Contact Person:
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Academic Programs
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PROGRAM APPLICATION
SUMMARY EVALUATION REPORT
Asheville-Buncombe Technical Community College
Brewing, Distillation and Fermentation (A15xxx)

I. Program Planning

Asheville-Buncombe Technical Community College (ABTCC) is seeking approval for the Brewing, Distillation and Fermentation (A15xxx) program to begin Fall 2013. The planning area is defined as the college's service area of Buncombe and Madison counties. All colleges were notified of the planning process for this program.

The proposed program was approved by the Board of Trustees at Asheville Buncombe Technical Community College on November 12, 2012. Minutes from this Board meeting were attached to the program application. The President and the Board of Trustees of Asheville-Buncombe Technical Community College have certified the following:

- The proposed program will enhance the workforce of North Carolina, will provide educational and training opportunities consistent with the mission of the college, and will not duplicate the opportunities currently offered.
- They have assessed the need for the proposed program and the resources required to maintain a viable program and certify that the college can operate the proposed program efficiently and effectively within the resources available to the college.
- The college will complete a program accountability report including student success measures, enrollment trends, completion rates, and employment data three years after implementation of the program.

II. Program Rationale

Asheville-Buncombe Technical Community College indicates the following:

- The Asheville region will be adding the new production and distribution facilities of New Belgium Brewing (America's third largest craft brewer) which should bring over 154 jobs to their brewery site by 2015. In addition to the brewery, the company will build an east coast distribution warehouse, hospitality tasting room and European-style beer garden. The average wage for New Belgium Brewing employees will exceed $50,000 annually.
- Several other breweries are scheduled to open in the near future (Burial Beer, Catawba Valley Brewing-Asheville, Pack's Tavern, One World Brewing, Twin Leaf Brewery).
- According to the Asheville Chamber of Commerce, an additional 260 jobs, related to the industry, will be added by industry vendors/suppliers who could generate an additional $18.3 million annually in local paychecks and $30.2 million additional local, state and federal taxes *(2012 Economic Impact Analysis Project-Asheville Chamber).*

- Several distillery operations (Adam Dalton, Howling Moon and Troy & Sons) are now located in the college's service area.

- Asheville is home to the Highland Brewery, the largest microbrewery in Asheville and in the top four in microbrew sales throughout the Southeast. ABTCC's service area is also home to 13 craft breweries (Alamont Brewing, Asheville Brewing Company, Biltmore Brewing Company, Buchi Kombucha, French Broad Brewing Company, Green Man Brewery, Highland Brewing Company, Lexington Avenue Brewery, Oyster House Brewing Company, Pisgah Brewing Company, Thirsty Monk Pub and Brewing, Wedge Brewery, and Wicked Weed Brewing).

- For the fourth consecutive year, Asheville was awarded the national title of Beer City USA, as voted by the readers of examiner.com.

- Local brewers have expressed their need for additional skilled and qualified employees to support their individual growth plans. They have worked in collaboration with the college in the development of the proposed program.

- The impact of craft beer and microbreweries on Buncombe County's tourism industry is showcased in several annual "brew" events: Oktoberfest, Winter Warmer Beer Festival, Asheville Beer Week, Beer City Festival, Craft Beer Festival, and Brewgrass Festival. Plans are in place to develop tours of the New Belgium brewery which should further enhance the tourism industry.

- In Fall of 2012, ABTCC began to test market student interest in brewing related courses through Continuing Education (CE). Two 18-hour certificate programs were offered and immediately became the fastest selling CE classes in college history with over 50+ students enrolled. Additional courses continue to be offered, each filled to capacity.

- In March of 2013, thirty-eight CE students enrolled in brewing classes were surveyed regarding need for further education. Of the group, 74% responded with strong interest in pursuing an Associate of Applied Science degree in Brewing, Distillation and Fermentation.

- ABTCC has committed over 8,000 sq. ft. of production, lab, and classroom/office space to this degree. College directed financial resources have been earmarked to properly outfit the facility with state-of-art equipment so that the students choosing to enhance their future may be trained to international industry standards, therefore optimizing employment opportunities.

- If the proposed program is approved, a 2+2 articulation agreement will be finalized between ABTCC and Appalachian State University in Fermentation Science.

- Economic Modeling Specialists, Int. (EMSI) projects a 237% regional increase in brewery jobs between 2008 and 2012. EMSI has also identified job growth for Buncombe and Madison counties in several beverage-related industries (2010-2020):

  Beer and Ale Merchant Wholesalers
  16.7% growth with average annual earnings of $46,665
  Wine and Distilled Alcoholic Beverage Merchant Wholesalers
  39.6 % growth with average annual earnings of $37, 297
  Drinking Places (Alcoholic Beverages)
  53.8% growth –compared to a national increase of 9.1% with average annual earnings of $20,744
  Beer/Wine/Liquor Stores
  30.5% growth with average annual earnings of $23,942

- The college provided many letters indicating stakeholder support including: Asheville Brewing Company, Blue Ridge Food Ventures, Economic Development Coalition – Asheville Buncombe County, French Broad Brewing Company, Highland Brewing Company, New Belgium, Skyland Distributing Company, Tipping Point Brewing, Van Winkle Law Firm, Wedge Brewing Company, and Westville Pub.

III. Impact of the Proposed Program on Other Programs

This program would be new to the community college system. There are three colleges (Asheville Buncombe Technical Community College, Blue Ridge Community College and Rockingham Community College) that have collaborated on the development of the proposed Brewing, Distillation and Fermentation program**.** All three colleges have submitted program applications, and are requesting State Board approval to begin the program in fall of 2013.

The proposed, new program has three pathways (Specialty Agriculture for Fermentation; Brewing Production, Marketing and Management; and Brewing Equipment, Packaging and Maintenance) which provide a distinct focus for each college. ABTCC's program will focus on the Brewing Production, Marketing and Management pathway.

ABTCC sent an impact assessment form to Blue Ridge Community College, which is located in a contiguous county. Blue Ridge does not perceive a negative impact to implementation of their program due to the difference in course offerings. Both colleges feel that the program offering by both colleges will strengthen the region's economic impact and program delivery.

IV. Implementation of Collaborative Plan

Not Applicable

V. Curriculum Design

The proposed program of study is in compliance with the proposed curriculum standard.

Director: Ms. Jennifer Frazelle

C. Institutional Certification: *Complete the following form and obtain required signatures. Form with original signatures should be included in the application.*

Institutional Certification

This curriculum program A.A.S. degree in Brewing, Distillation and Fermentation
(Program Title)

01.0401
(CIP Code)

will enhance the workforce of North Carolina, will provide educational and training opportunities consistent with the mission of the college, and will not duplicate the opportunities currently offered.

Asheville-Buncombe Technical Community College
(Community College Name)

has assessed the need for this program and the resources required to maintain a viable program and certifies that the college can operate this program efficiently and effectively within the resources available to the college.

The college understands that this proposed program will require a program accountability report that will include items such as student success measures, enrollment trends, completion rates, and employment data three years after implementation if the program is approved by the State Board.

(A copy of the minutes from the Board of Trustees meeting(s) where the proposed program was discussed and approved must be attached to the application.)

Signature, President of College — *Date* 2/29/13

Signature, Board of Trustees Chair — *Date* 2/25/13

PROGRAM APPLICATION
SUMMARY EVALUATION REPORT
Blue Ridge Community College
Brewing, Distillation and Fermentation (A15xxx)

I. Program Planning

Blue Ridge Community College (BRCC) is seeking approval for the Brewing, Distillation and Fermentation (A15xxx) program to begin Fall 2013. The planning area is defined as the college's service area of Henderson and Transylvania counties. All colleges were notified of the planning process for this program.

The proposed program was approved by the Board of Trustees at Blue Ridge Community College on January 14, 2013. Minutes from this Board meeting were attached to the program application. The President and the Board of Trustees of Blue Ridge Community College have certified the following:

- The proposed program will enhance the workforce of North Carolina, will provide educational and training opportunities consistent with the mission of the college, and will not duplicate the opportunities currently offered.
- They have assessed the need for the proposed program and the resources required to maintain a viable program and certify that the college can operate the proposed program efficiently and effectively within the resources available to the college.
- The college will complete a program accountability report including student success measures, enrollment trends, completion rates, and employment data three years after implementation of the program.

II. Program Rationale

Blue Ridge Community College indicates the following:

- Two major brewing companies, Oskar Blues and Sierra Nevada, the second largest Craft Brewing Company in the nation, have announced plans that they will locate in the region. Oskar Blues has been located in retrofitted facility in Transylvania County and is now producing beer. Sierra Nevada has purchased 180 acres along the French Broad River in Henderson County. Additionally, a number of craft breweries, wineries, and hard cider production facilities plan to expand production in the area.

- College staff traveled to the Sierra Nevada facility in Chico, California, to profile jobs under the ACT WorkKeys System. It was determined that employees required skill sets in the areas of electronics, programmable logic controls, automation, packaging, maintenance, and hydraulics, as well as skills associated with brewing fermented products. The college worked alongside Asheville-Buncombe Technical Community College and Rockingham Community College to develop an appropriate curriculum to support the brewing, distribution and fermentation industry.

- Henderson County has a history of apple farming dating back to the 1800's and local farmers have recently expanded into viticulture in an attempt to meet global economies. In 2012, Burntshirt and St. Paul's Vineyards opened in Henderson County. Both companies have indicated they will expand production into hard cider. Individuals possessing similar skills sets to those learned in the Brewing, Distillation, and Fermentation (BDF) program pathway for equipment, packaging, and maintenance, should find employment opportunities in these and other similar food-packaging industries.
- In spring of 2013, BRCC's continuing education department registered 187 students for courses in the Craft Beer Academy.
- Letters of support from Oskar Blues Brewery, Sierra Nevada Brewing Company, Southern Appalachian Brewery, and Brevard Brewing Company indicate that the companies are willing to hire adequately prepared graduates of the BDF program. These companies are expecting to see significant growth in upcoming years.

III. Impact of the Proposed Program on Other Programs

This program would be new to the community college system. There are three colleges (Asheville Buncombe Technical Community College, Blue Ridge Community College and Rockingham Community College) that have collaborated on the development of the proposed Brewing, Distillation and Fermentation program**.** All three colleges have submitted program applications, and are requesting State Board approval to begin the program in fall of 2013.

The proposed, new program has three pathways (Specialty Agriculture for Fermentation; Brewing Production, Marketing and Management; and Brewing Equipment, Packaging and Maintenance) which provide a distinct focus for each college. BRCC's program will focus on the Brewing Equipment, Packaging and Maintenance pathway.

BRCC sent an impact assessment form to Asheville-Buncombe Technical Community College, which is located in a contiguous county. AB Tech does not perceive a negative impact to implementation of their program due to the difference in course offerings. Both colleges feel that the program offering by both colleges will strengthen the region's economic impact and program delivery.

IV. Implementation of Collaborative Plan

Not Applicable

V. Curriculum Design

The proposed program of study is in compliance with the proposed curriculum standard.

Coordinator: Mr. Frank Scuiletti

C. Institutional Certification: *Complete the following form and obtain required signatures. Form with original signatures should be included in the application.*

Institutional Certification

This curriculum program Brewing, Distillation and Fermentation *(Program Title)* CIP Code: 01.0401 *(Program Code)*

will enhance the workforce of North Carolina, will provide educational and training opportunities consistent with the mission of the college, and will not duplicate the opportunities currently offered.

Blue Ridge Community College
(Community College Name)

has assessed the need for this program and the resources required to maintain a viable program and certifies that the college can operate this program efficiently and effectively within the resources available to the college.

The college understands that this proposed program will require a program accountability report that will include items such as student success measures, enrollment trends, completion rates, and employment data three years after implementation if the program is approved by the State Board.

(A copy of the minutes from the Board of Trustees meeting(s) where the proposed program was discussed and approved must be attached to the application.)

Signature, President of College — *Date* 2/13/13

Signature, Board of Trustees Chair — *Date* 2/13/13

PROGRAM APPLICATION
SUMMARY EVALUATION REPORT
Rockingham Community College
Brewing, Distillation and Fermentation (A15XXX)

I. Program Planning

Rockingham Community College is seeking approval for the Brewing, Distillation and Fermentation (A15XXX) program to begin Fall 2013. The planning area is defined as the college's service area of Rockingham County. All colleges were notified of the planning process for this program.

The proposed program was approved by the Board of Trustees at Rockingham on November 13, 2012. Minutes from this Board meeting were attached to the program application. The President and the Board of Trustees of Rockingham Community College have certified the following:

- The proposed program will enhance the workforce of North Carolina, will provide educational and training opportunities consistent with the mission of the college, and will not duplicate the opportunities currently offered.
- They have assessed the need for the proposed program and the resources required to maintain a viable program and certify that the college can operate the proposed program efficiently and effectively within the resources available to the college.
- The college will complete a program accountability report including student success measures, enrollment trends, completion rates, and employment data three years after implementation of the program.

II. Program Rationale

Rockingham Community College indicates the following:

- MillerCoors, with more than 670 employees, is the largest employer in Rockingham County. Piedmont Distillers is also located within the college's service area. Both firms provided letters of support, as did the North Carolina Brewers Guild, the Rockingham County Partnership for Economic and Tourism Development, the Upper Piedmont Research Station of North Carolina State University, and the City of Eden.
- Since 2012 the college has offered courses in brewing, fermentation, and distillation to more than 120 students through continuing education. The Dean of Continuing Education indicates that these students have expressed interest in curriculum courses.
- MillerCoors anticipates a significant number of retirements in the immediate future. They have recently increased their educational requirements for new employees and assisted with the development of the proposed program.
- Piedmont Distillers will be opening two new lines of operation that will create 24 new jobs.

- The City of Eden has donated a downtown space to the college to establish an off-campus brewery.

- Graduates of the program will have the opportunity to earn brewing qualifications from the Institute of Brewing & Distilling, an international professional organization.

III. Impact of the Proposed Program on Other Programs

This program would be new to the community college system. There are three colleges (Asheville Buncombe Technical Community College, Blue Ridge Community College and Rockingham Community College) that have collaborated on the development of the proposed Brewing, Distillation and Fermentation program**.**

The proposed, new program has three pathways (Specialty Agriculture for Fermentation; Brewing Production, Marketing and Management; and Brewing Equipment, Packaging and Maintenance) which provide a distinct focus for each college. Rockingham Community College's program will focus on the Brewing Equipment, Packaging and Maintenance and the Specialty Agriculture for Fermentation pathways.

There are no colleges offering similar programs or colleges proposing to offer the new program which have a service area contiguous to Rockingham County.

IV. Implementation of Collaborative Plan

Not Applicable

V. Curriculum Design

The proposed program of study is in compliance with the proposed curriculum standard.

Director: Ms. Jennifer Frazelle

C. Institutional Certification: *Complete the following form and obtain required signatures. Form with original signatures should be included in the application.*

Institutional Certification

This curriculum program **Brewing, Distillation, and Fermentation** *(Program Title)* **AXXXXXX** *(Program Code)*

will enhance the workforce of North Carolina, will provide educational and training opportunities consistent with the mission of the college, and will not duplicate the opportunities currently offered.

Rockingham Community College
(Community College Name)

has assessed the need for this program and the resources required to maintain a viable program and certifies that the college can operate this program efficiently and effectively within the resources available to the college.

The college understands that this proposed program will require a program accountability report that will include items such as student success measures, enrollment trends, completion rates, and employment data three years after implementation if the program is approved by the State Board.

(A copy of the minutes from the Board of Trustees meeting(s) where the proposed program was discussed and approved must be attached to the application.)

Signature, President of College - Dr. Michael S. Helmick — **11-13-12** *Date*

Signature, Board of Trustees Chair – C. Grayson Whitt — **11-13-12** *Date*

Curriculum Standard for Brewing, Distillation and Fermentation

Career Cluster: Agriculture, Food & Natural Resources**

Cluster Description: The production, processing, marketing, distribution, financing, and development of agricultural commodities and resources including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources..

Pathway: Food Products and Processing Systems | **Effective Term:** Fall 2013 (2013*03)

Program Majors Under Pathway

Program Major / Classification of Instruction Programs (CIP) Code		Credential Level(s) Offered	Program Major Code
Brewing, Distillation and Fermentation	CIP Code 01.0401	AAS/Diploma/Certificate	A15XXX

Pathway Description:

This curriculum is designed to prepare individuals for various careers in the brewing, distillation and fermentation industry. Classroom instruction, practical laboratory applications of brewing, distillation and fermentation principles and practices are included in the program of study.

Course work in brewing, distillation and fermentation includes production, operations, safety and sanitation, and associated process technologies. Related course work is offered in fermentation production, safety and sanitation, applied craft beverage microbiology, agriculture, marketing, management, equipment, packaging, and maintenance.

Graduates should qualify for employment opportunities in the brewing, distillation and fermentation industry. Students may be eligible to sit for the professional Institute of Brewing and Distilling (IBD) certification exams which correspond to the program of study.

Program Major Description: Choose one of the following ***4th paragraphs*** *to use in conjunction with the first three paragraphs of the pathway description above for documentation used to identify each* ***Program Major:***

Brewing, Distillation and Fermentation: A program that prepares individuals to apply technical knowledge and skills to brew, distill and ferment various products, including beverages. Includes instruction in production of fermented products, cultivating, marketing, management, legal issues, inspection, maintenance, service and repair of equipment, facility operations, packaging, sanitation, and welding.

**Within the degree program, the institution shall include opportunities for the achievement of competence in reading, writing, oral communication, fundamental mathematical skills, and basic use of computers.*

Approved by the State Board of Community Colleges on_____.

I. General Education Academic Core

[*Curriculum Requirements for associate degree, diploma, and certificate programs in accordance with 23 SBCC 02E.0204(3)]*: *Degree programs must contain a minimum of 15 semester hours including at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural sciences/mathematics. Degree programs must contain a minimum of 6 semester hours of communications. Diploma programs must contain a minimum of 6 semester hours of general education; 3 semester hours must be in communications. General education is optional in certificate programs.*

Plant Systems: Brewing, Distillation and Fermentation

Recommended General Education Academic Core				AAS	Diploma	Certificate
Minimum General Education Hours Required:				**15 SHC**	**6 SHC**	**0 SHC**
Courses listed below are recommended general education courses for this curriculum standard. Colleges may choose to include additional or alternative general education courses to meet local curriculum needs.						
Communication:						
*COM	101	Workplace Communication	3 SHC	**6 SHC**	**3-6 SHC**	**Optional**
COM	120	Intro Interpersonal Com	3 SHC			
COM	231	Public Speaking	3 SHC			
*ENG	101	Applied Communications I	3 SHC			
*ENG	102	Applied Communications II	3 SHC			
ENG	110	Freshman Composition	3 SHC			
ENG	111	Expository Writing	3 SHC			
ENG	112	Argument-Based Research	3 SHC			
ENG	114	Prof Research & Reporting	3 SHC			
ENG	115	Oral Communication	3 SHC			
ENG	116	Technical Report Writing	3 SHC			
Humanities/Fine Arts:						
*HUM	101	Values in the Workplace	2 SHC			
HUM	110	Technology and Society	3 SHC	**3 SHC**	**0-3 SHC**	**Optional**
HUM	115	Critical Thinking	3 SHC			
HUM	230	Leadership Development	3 SHC			
PHI	230	Introduction to Logic	3 SHC			
PHI	240	Introduction to Ethics	3 SHC			
Social /Behavioral Sciences:						
ECO	151	Survey of Economics	3 SHC	**3 SHC**	**0-3 SHC**	**Optional**
ECO	251	Prin of Microeconomics	3 SHC			
GEO	110	Introduction to Geography	3 SHC			
GEO	111	World Regional Geography	3 SHC			
*PSY	101	Applied Psychology	3 SHC			
*PSY	102	Human Relations	2 SHC			
PSY	118	Interpersonal Psychology	3 SHC			
PSY	135	Group Processes	3 SHC			
PSY	150	General Psychology	3 SHC			
*SOC	105	Social Relationships	3 SHC			
SOC	210	Introduction to Sociology	3 SHC			
SOC	215	Group Processes	3 SHC			
Natural Sciences/Mathematics:						
BIO	111	General Biology I	4 SHC			
BIO	140	Environmental Biology	3 SHC	**3 SHC**	**0-3 SHC**	**Optional**
BIO	160	Introductory Life Science	3 SHC			
BIO	175	General Microbiology	3 SHC			
CHM	130	Gen, Org, & Biochemistry	3 SHC			
CHM	131	Introduction to Chemistry	3 SHC			
CHM	132	Organic and Biochemistry	4 SHC			
CHM	151	General Chemistry I	4 SHC			
CHM	152	General Chemistry II	4 SHC			
*MAT	101	Applied Mathematics I	3 SHC			
MAT	110	Mathematical Measurement	3 SHC			

Approved by the State Board of Community Colleges on_____.

MAT 115	Mathematical Models	3 SHC			
MAT 120	Geometry and Trigonometry	3 SHC			
MAT 121	Algebra and Trigonometry I	3 SHC			
MAT 140	Survey of Mathematics	3 SHC			
MAT 151	Statistics I	3 SHC			
MAT 155	Statistical Analysis	3 SHC			
MAT 161	College Algebra	3 SHC			
MAT 171	Precalculus Algebra	3 SHC			
PHY 110	Conceptual Physics	3 SHC			

II. Major Hours. AAS, diploma, and certificate programs must include courses which offer specific job knowledge and skills. Work experience, including cooperative education, practicums, and internships, may be included in associate in applied science degrees up to a maximum of 8 semester hours of credit; in diploma programs up to a maximum of 4 semester hours of credit; and in certificate programs up to a maximum of 2 semester hours of credit. Below is a description of each section under Major Hours.

A. Technical Core. The technical core is comprised of specific courses which are required for all Program Majors under this Curriculum Standard. A diploma program offered under an approved AAS program standard or a certificate which is the highest credential level awarded under an approved AAS program standard must include a minimum of 12 semester hours credit derived from the curriculum core courses or core subject area of the AAS program.

B. Program Major(s). The Program Major must include a minimum of 12 semester hours credit from required subjects and/or courses. The Program Major is in addition to the technical core.

C. Other Major Hours. Other major hours must be selected from prefixes listed on the curriculum standard. A maximum of 9 semester hours of credit may be selected from each prefix listed, with the exception of prefixes listed in the core.

Plant Systems: Brewing, Distillation and Fermentation	**AAS**	**Diploma**	**Certificate**
Minimum Major Hours Required:	**49 SHC**	**30 SHC**	**12 SHC**
A. Technical Core: *Courses required for the diploma are designated with an asterisk (*).*	**29-36**	**20-21**	
*BDF 110 Fermentation Production 4 SHC *BDF 111 BDF Safety and Sanitation 4 SHC *BDF 115 Applied Craft Bev Microbiology 4 SHC			
***Agriculture / Sustainability (Choose one)** AGR 139 Intro to Sustainable Ag 3 SHC AGR 160 Plant Science 3 SHC HOR 245 Hor Specialty Crops 3 SHC SST 110 Intro to Sustainability 3 SHC			
***Business/Entrepreneurship (Choose one)** BUS 110 Introduction to Business 3 SHC BUS 137 Principles of Management 3 SHC ETR 210 Intro to Entrepreneurship 3 SHC BDF 261 Bev Marketing & Sales 3 SHC			
***Facility Operations (Choose one)** MNT 110 Intro to Maint Procedures 2 SHC MNT 165 Mechanical Industrial Systems 2 SHC ISC 112 Industrial Safety 2 SHC HRM 135 Facilities Management 3 SHC			

Required Subject Areas: Select one pathway				
Specialty Agriculture for Fermentation				
HOR 162	Applied Plant Science	3 SHC		
HOR 166	Soils & Fertilizers	3 SHC		
BDF 210	Hops Selection and Production	4 SHC		
Brewing Production, Marketing and Management				
BDF 215	Legal Issues-Fermentation	3 SHC		
HRM 220	Cost Control-Food & Bev	3 SHC		
HRM 225	Beverage Management	3 SHC		
Brewing Equipment, Packaging and Maintenance				
ATR 112	Intro to Automation	3 SHC		
	Or			
ELC 128	Intro to PLC	3 SHC		
	Or			
ELN 260	Prog Logic Controllers	4 SHC		
BDF 236	Brewing/Packaging Maintenance	4 SHC		
HYD 110	Hydraulics/Pneumatics I	3 SHC		
WLD 214	Sanitary Welding	4 SHC		
B. Program Major: Not Applicable				

C. Other Major Hours.
T*o be selected from the following prefixes:*

ACC, AGR, AHR, ALT, ATR, BDF, BIO, BPA, BPM, BTC, BUS, CHM, CIS,COE, CTS, CUL, CSV, DBA, ECO, EGR, ELC, ELN, ENV, ETR, FPR, FST, HOR, HRM, HYD, ISC, LBT, LOG, MAC, MEC, MKT, MNT, OMT, PCI, PKG, PLU, REF, SST, TAT, VEN, WEB, WLD

Up to three semester hour credits may be selected from the following prefixes: ARA, ASL, CHI, FRE, GER, ITA, JPN, LAT, POR, RUS and SPA.

III. Other Required Hours

A college may include courses to meet graduation or local employer requirements in a certificate (0-1 SHC), diploma (0-4 SHC), or an associate in applied science (0-7 SHC) program. These curriculum courses shall be selected from the Combined Course Library and must be approved by the System Office prior to implementation. Restricted, unique, or free elective courses may not be included as other required hours.

IV. Employability Competencies

Fundamental competencies that address soft skills vital to employability, personal, and professional success are listed below. Colleges are encouraged to integrate these competencies into the curriculum by embedding appropriate student learning outcomes into one or more courses or through alternative methods.

A. Interpersonal Skills and Teamwork – The ability to work effectively with others, especially to analyze situations, establish priorities, and apply resources for solving problems or accomplishing tasks.

B. Communication – The ability to effectively exchange ideas and information with others through oral, written, or visual means.

C. Integrity and Professionalism – Workplace behaviors that relate to ethical standards, honesty, fairness, respect, responsibility, self-control, criticism and demeanor.

D. Problem-solving – The ability to identify problems and potential causes while developing and implementing practical action plans for solutions.

E. Initiative and Dependability – Workplace behaviors that relate to seeking out new responsibilities, establishing and meeting goals, completing tasks, following directions, complying with rules, and consistent reliability.

F. Information processing – The ability to acquire, evaluate, organize, manage, and interpret information.

G. Adaptability and Lifelong Learning – The ability to learn and apply new knowledge and skills and adapt to changing technologies, methods, processes, work environments, organizational structures and management practices.

H. Entrepreneurship – The knowledge and skills necessary to create opportunities and develop as an employee or self-employed business owner.

**The *North Carolina Career Clusters Guide was developed by the North Carolina Department of Public Instruction and the North Carolina Community College system to link the academic and Career and Technical Education programs at the secondary and postsecondary levels to increase student achievement. Additional information about Career Clusters is located at: http://www.nc-net.info/NC_career_clusters_guide.php or http://www.careertech.org.*

Summary of Required Semester Hour Credits (SHC) for each credential:

	AAS	Diploma	Certificate
Minimum General Education Hours	15	6	0
Minimum Major Hours	49	30	12
Other Required Hours	0-7	0-4	0-1
Total Semester Hours Credit (SHC)	**64-76**	**36-48**	**12-18**

Approved by the State Board of Community Colleges on_____.

STATE BOARD OF COMMUNITY COLLEGES

NEW CURRICULUM PREFIX - TIERED FUNDING FORMULA RECOMMENDATIONS

The State Board of Community Colleges is asked to assign the following new curriculum prefix to the NCCCS Tiered Funding Formula.

Tier I

BDF – Brewing, Distillation and Fermentation

Rationale: The Brewing, Distillation and Fermentation program requires state-of-the-art equipment in order for students to be fully trained to international industry standards.

Background

On July 15, 2011 the State Board of Community Colleges adopted the 2011-2012 State Aid Allocations and Budget Policies, which included implementation of the Tiered Funding Formula Model. To implement the Tiered Funding Formula Model, all existing curriculum and continuing education course prefixes were assigned to one of three funding levels: Tier 1 included selected high-cost curriculum courses, Tier 2 included all other curriculum courses and selected continuing education courses that are mapped to a third-party credential or certification, and Tier 3 included all other continuing education occupational extension courses.

On January 20, 2012, the State Board adopted the following guidelines for Assignment of New-to-System *Curriculum* Prefixes to the NCCCS Tiered Funding Formula.

Tier I:

- Curriculum Health Science Prefixes
- Curriculum Technical Education Prefixes in the areas of Construction, Engineering, Industrial Systems, and Transportation Systems
- Curriculum Lab-Based Science Prefixes
- Other Curriculum Prefixes Based on the Following Considerations:
    - Facility requirements; equipment start-up costs; equipment ongoing costs; supply and software start-up costs; supply and software ongoing costs; enrollment limitations resulting from student/faculty ratios or program enrollment caps; instructor costs resulting from SACS requirements, required licensure or certification, or market demand.

Tier II: All Other Curriculum Prefixes

Contact Person:
Jennifer Frazelle, Director
Academic Programs
919.807.7120
frazellej@nccommunitycolleges.edu

BREWING, DISTILLATION AND FERMENTATION

BDF 110 Fermentation Production

Class: 2 Lab: 4 Credit: 4

Prerequisites: None
Corequisites: None

This course introduces the basic methodologies used in fermentation. Emphasis is placed on the production of fermented products including ingredients, techniques, fermentation management, storage and sanitation. Upon completion, students should be able to design/produce pilot-scale products to demonstrate how material selection and process conditions can generate different kinds/qualities of products.

Student Learning Outcomes

1. Identify and develop proper workplace and personal safety and well-being prevention measures including; MSDS, HACCP and CIP plans.
2. Explain the operation and correct procedures required to produce proper fermented products.
3. Demonstrate proper fermented product production using basic ingredients and recipes.
4. Explain the operation and correct procedures required to maintain a variety of peripheral production equipment.
5. Identify the proper control system for purchase, handling and storage of raw materials used in production.

BDF 111 BDF Safety & Sanitation

Class: 3 Lab: 2 Credit: 4

Prerequisites: None
Corequisites: None

This course covers sanitation, handling and safety with fermentation products, facilities and equipment. Emphasis is placed on the proper chemicals, their selection, handling and storage for sanitation control within the fermentation environment. Upon completion, students should be able to safely maintain quality and stability of fermentation products.

Student Learning Outcomes

1. Demonstrate work place safety and hazardous waste disposal per OSHA and EPA guidelines that apply to relevant fermentation work.
2. Identify and communicate safety regulations as it applies to the fermentation environment.
3. Select proper chemical agents to clean fermentation equipment and its environment based on concentration levels, time and temperature.
4. Demonstrate appropriate storage and handling techniques of fermented products.
5. Distinguish between different fermentation sanitation cleaning techniques.

BDF 112 Survey of Fermented Products

Class: 3 Lab: 3 Credit: 4

Prerequisites: None
Corequisites: None

This course provides an introduction to fermented products. Emphasis is placed on history, production, characteristics, taxonomy, and evaluation. Upon completion, students should be able to identify and apply factors relevant to the production of fermented products.

Student Learning Outcomes

1. Describe the distinguishing characteristics of beer, wine, distilled spirits, and fermented foods and beverages.
2. Identify the major grape varietals and growing regions of the world associated with wine.
3. Explain beer, wine, spirit and other fermented beverage production process from the original product to the finished beverage.
4. Explain the production process of fermented foods.
5. Describe the major beer styles (ales/lagers) recognized by Beer Judges Certification Program and the regions of the world to which they are associated.
6. Describe the major spirit styles and regions of the world to which they are associated.

BDF 113 Careers in Fermentation

Class: 1 Lab: 0 Credit: 1

Prerequisites: None
Corequisites: None

This course introduces career opportunities available and preferred management practices in the brewing, distillation and fermentation industry. Topics include career choices, self-assessment, and development of career pathways supporting occupational interests, and creating/utilizing the portfolio as a credential. Upon completion, students should be able to manage their learning experience to meet their personal direction of career specialization.

Student Learning Outcomes

1. Identify different career pathways within the fermentation industry.
2. Evaluate self-assessment tools to benefit probable student career strengths.
3. Create and utilize a portfolio as a credential.

BDF 114 Craft Beer Brewing

Class: 1 Lab: 3 Credit: 2

Prerequisites: None
Corequisites: None

This course introduces entry level skills in craft beer brewing. Topics include recipe development, basic sanitation, techniques and equipment used in the production of small batches (5 gallons or less) of craft beer. Upon completion, students should be able to demonstrate how to produce small batches of craft beer and be able to extrapolate concepts to larger future production.

Student Learning Outcomes

1. Identify materials (grains, hops, yeast, water) used in small batch brewing.
2. Develop recipe for small batch brewing and show ability to convert to larger system.
3. Demonstrate proper sanitation for small batch brewing.
4. Use proper brewing techniques on small batch brewing systems to produce craft beer.

BDF 115 Applied Craft Bev Microbiology

Class: 3 Lab: 2 Credit: 4

Prerequisites: None
Corequisites: None

This course provides an introduction to microbiology and laboratory practices in the brewing industry. Emphasis is placed on yeast biology, fermentation, and microorganisms in brewery/distillation and sanitation. Upon completion, students should be able to demonstrate an understanding of microbiology, laboratory techniques, and commonly used analysis methodologies applied in the brewing industry.

Student Learning Outcomes

1. Identify strains of yeast used in the production of ales and lagers.
2. Identify the biology of yeast, cell structure, and physiology.
3. Describe the process of yeast propagation, vitality and role in health.
4. Choose and maintain yeast based on analytical, microbiological, and sensory data.
5. Identify microorganisms in brewing and their impact on the process.
6. Identify infection sources and systems for infection elimination.

BDF 125 Bev Tech & Calculations

Class: 1 Lab: 3 Credit: 2

Prerequisites: None
Corequisites: None

This course introduces technology and mathematical calculations used in craft beverage production. Emphasis is placed on equipment and technology relating to scheduling/record keeping, and recipe development/alcohol control and ingredient usage calculations. Upon completion, students should be able to identify/demonstrate technology and equipment used in craft beverage production and recipe development.

Student Learning Outcomes

1. Determine standard brewing calculations and adjust existing operations and materials to meet finished product.
2. Calculate and convert common internationally used brewing measurement systems.
3. Create brewing recipes to optimize finished product quality.
4. Explain the basic design, operation of hardware/software technology related to the fermented beverage industry.

BDF 160 Food & Beverage Pairing

Class: 2 Lab: 2 Credit: 3

Prerequisites: None
Corequisites: None

This course introduces theoretical and practical aspects of the art and science of food and craft beverage pairings. Emphasis is placed on consumer perception/acceptance of food/craft beverage pairings through sensory evaluation. Upon completion, students should be able to pair food qualities with beverages and utilize appropriate service and presentation techniques.

Student Learning Outcomes

1. Characterize the direct relationship between the food and beverage service provider and the guest.
2. Demonstrate proper food and beverage service of a multi-course meal using correct procedures for American Plate Service.
3. Identify traditional food/beverage pairings and the relationship to the original culture/country.
4. Analyze in sensory evaluation the relationship of flavor to food and beverage individually and combined.
5. Design food/drink choice recommendations to typical and specialty menu selections.

BDF 170 Bev Tour & Tasting Mgmt

Class: 2 Lab: 2 Credit: 3

Prerequisites: None
Corequisites: None

This course covers the role of craft beverage as a destination attraction. Emphasis is placed on developing, marketing and managing the craft beverage experience including customer service, special events, and tasting room operations. Upon completion, students should be able to demonstrate tasting room management for craft beverages and its applications to tourism and economic development.

Student Learning Outcomes

1. Explain the equipment and product and staffing requirements that contribute to creation of a quality tasting room,
2. Design a tasting room appropriate for guest that promotes sales and conveys an appropriate theme to producer.
3. Analyze beverage tourism marketing strategies and trends to develop a marketing plan.
4. Explain quality service management best practices and relationship to retail revenue development.
5. Create special event production plans to promote, brand, and build relationships as a destination attraction.

BDF 175 Distillation Operations

Class: 2 Lab: 4 Credit: 4

Prerequisites: None
Corequisites: None

This course covers the principles and production techniques involved in the distillation of grains, fruits, and other carbohydrates associated with craft beverage distillation. Emphasis is placed on materials/processing, fermentation applications, distillation technology, sensory evaluation, quality control, engineering, and craft distillery management. Upon completion, students should be able to demonstrate an understanding of distillation operation/management and the impact of sanitation, fermentation, maturation and aging in the production of distillations.

Student Learning Outcomes

1. Explain health and safety operations including chemicals, high temperature product, and equipment to ensure a safe workplace environment.
2. Produce distilled beverages from grains and fruits using industry standard equipment.
3. Operate and properly control all related production equipment and raw materials in a safe and sanitary manor.
4. Introduce specialty production opportunities in distillation that optimizes product styles.
5. Analyze quality control standards and specific management issues to the production of distilled products.

BDF 180 Sensory Evaluation

Class: 2 Lab: 3 Credit: 3

Prerequisites: None
Corequisites: None

This course introduces the visual, olfactory, and gustatory parameters used in the evaluation of beer and distillery products. Emphasis is placed on aromas, finish, flavor/taste interactions, and factors affecting product quality, as well as descriptive analysis/model systems, judging systems, set-up, and operation for beverage competitions. Upon completion, students should be able to demonstrate the fundamental principles/practices in sensory analysis and identify elements that influence sensory qualities of particular craft beverages.

Student Learning Outcomes

1. Explain specific aspects and characters that should be evaluated within a sensory evaluation of fermented beverages.
2. Design an ideal tasting environment and minimize internal and external factors that can cause negative effect.
3. Interpret the presence of distinct ingredients and production techniques on the finished product, through sensory evaluation.
4. Discus the qualities and classification of fermented beverages using defined evaluation terminology and techniques.
5. Judge off-flavors of beverages by use of sensory evaluation techniques and applied use of common off-flavors found in finished products.
6. Analyze qualitative and quantitative sensory data results from different measurement scales used to collect data.
7. Design a competitive judging evaluation including set-up, panel selection, and operation.

BDF 210 Hops Selection and Production

Class: 2 Lab: 4 Credit: 4

Prerequisites: None
Corequisites: None

This course covers the selection and cultivation of hops for the production of fermented products. Emphasis is placed on varietal selection for the local region, yard establishment, harvest, post-harvest handling, production, drying, and pelletizing. Upon completion, students should be able to select the correct varieties, cultivate, harvest, and process hops for fermented products.

Student Learning Outcomes

1. Identify proper hops varieties for the local region.
2. Demonstrate proper harvesting and handling of hops.
3. Successfully dry and pelletize hops for storage and use in fermented products.
4. Demonstrate proper cultivation on hop trellis system.
5. Demonstrate proper harvest procedures for cultivated hops.

BDF 213 Malting

Class: 2 Lab: 4 Credit: 4

Prerequisites: None
Corequisites: None

This course covers processes and technologies used in malting grains for fermented products. Emphasis is placed on grain selection for different product styles, science of malting grain, and analysis of malted products as they pertain to fermented products. Upon completion, students should be able to select proper grain and complete the malting process according to Institute of Brewing and Distilling (IBD) malting standards.

Student Learning Outcomes

1. Explain different steeps and kiln designs according to IBD standards.
2. Explain the science involved in malting process.
3. Explain water uptake by grains and other objectives of steeping.
4. Identify changes that occur during germination and recognize changes that occur during kilning and roasting.
5. Analyze grain for malting.
6. Identify different grain types by varieties.
7. Identify the microbes, diseases, and pests that affect grain according to IBD standards.

BDF 215 Legal Issues-Fermentation

Class: 3 Lab: 0 Credit: 3

Prerequisites: None
Corequisites: None

This course covers the laws and regulatory environment particular to the brewing, distillation and fermentation industry. Emphasis is placed on social/ethical responsibilities and the state/federal regulations including licensing, taxation, labeling, record keeping, permits, inspections and laws regarding interstate and international commerce. Upon completion, students should be able to demonstrate an understanding of the laws and regulations that influence the brewing, distillation and fermentation industry.

Student Learning Outcomes

1. Analyze the social/ethical responsibilities of the fermented beverage industry including safe alcohol service, dram shop laws and alcohols relationship to society.
2. Examine the state/federal compliance regulations relating to distribution, sales, marketing and taxation.
3. Examine the state/federal compliance regulations relating to licensing, permits and inspections.
4. Discuss the importance and impact of trade organizations from the state, national and international level.
5. Explain the different legal requirements levied on the separate segments of the fermented beverage industry.

BDF 220 Applied Craft Bev Chemistry

Class: 3 Lab: 2 Credit: 4

Prerequisites: None
Corequisites: None

This course introduces chemistry fundamentals as they apply to the brewing and distillation industry. Emphasis is placed on elements impacting brewing/distillation including ingredient analysis/fermentation/production chemicals, and properties of gasses/liquids, pH, and pressure. Upon completion, students should be able to demonstrate basic chemistry principles/laboratory techniques to assess/control chemical properties associated with major products of the alcoholic beverage industry.

Student Learning Outcomes

1. Explain basic chemistry concepts and apply laboratory concepts to fermented beverage science.
2. Apply basic principles of quality management and control of chemical properties of fermented products.
3. Apply cleaning and sanitation requirements applied in the chemistry of brewing.
4. Explain the chemistry of brewing ingredients, brewing process including fermentation and post-fermentation.

BDF 225 Filtration & Finishing

Class: 2 Lab: 2 Credit: 3

Prerequisites: None
Corequisites: None

This course covers processing/conditioning factors that affect the end quality and shelf life of fermented craft beverages. Topics include types/operation of filters, natural/forced carbonation, clarification, lagering, additives and product stabilization for packaging. Upon completion, students should be able to demonstrate an understanding of the processes associated with filtration, carbonation and finishing and their impact on the end product.

Student Learning Outcomes

1. Examine the different types of filters used in the production of fermented beverages.
2. Discuss the different aids used in the clarification of beer and the development of haze formation.
3. Employ different methods of forced and natural carbonation.
4. Evaluate the operation and design of centrifuges.

BDF 230 Advanced Brewing

Class: 2 Lab: 4 Credit: 4

Prerequisites: BDF 114 Craft Beer Brewing
Corequisites: None

This course covers advanced brewing processes utilizing the equipment of an on-site brewery and fermentation facility. Topics include advanced beer making processes, analysis/monitoring of fermentation, specialty beer production, quality control, sustainable practices and facilities operations and management. Upon completion, students should be able to understand and demonstrate the proper applications of high volume brewing in a production facility.

Student Learning Outcomes

1. Explain health and safety operations including chemicals, high temperature product and equipment to insure a safe workplace environment.
2. Produce fermented beverages using industry standard equipment.
3. Operate and properly control all related production equipment and raw materials in a safe and sanitary manner.
4. Introduce specialty beer production and related operational requirements.
5. Apply quality control standards to the production of fermented products.

BDF 230A Advanced Brewing Lab

Class: 0 Lab: 2 Credit: 1

Prerequisites: None
Corequisites: BDF 230 Advanced Brewing

This course provides additional laboratory experience for enhancing student skills in advanced brewing processes utilizing the equipment of an on-site brewery and fermentation facility. Topics include advanced beer making processes, analysis/monitoring of fermentation, specialty beer production, quality control, sustainable practices and facilities operations and management. Upon completion, students should be able to demonstrate the proper applications of high volume brewing in a production facility.

Student Learning Outcomes

1. Explain health and safety operations including chemicals, high temperature product and equipment to insure a safe workplace environment.
2. Produce fermented beverages using industry standard equipment.
3. Operate and properly control all related production equipment and raw materials in a safe and sanitary manner.
4. Introduce specialty beer production and related operational requirements.
5. Apply quality control standards to the production of fermented products.

BDF 236 Brewing/Packaging Maintenance

Class: 2 Lab: 4 Credit: 4

Prerequisites: None
Corequisites: None

This course covers the equipment in a brewing, distillation and fermentation facility and the techniques used for maintenance and troubleshooting. Topics include types of equipment, the role of equipment used in filling and packaging, troubleshooting, and the role of a maintenance technician. Upon completion, students should be able to set up, maintain and troubleshoot equipment in a brewing, distillation and fermentation facility using techniques appropriate for the industry.

Student Learning Outcomes

1. Demonstrate safe practices and procedures with tools, materials and industry accepted test equipment covered in the course.
2. Demonstrate appropriate use of test equipment, evaluate equipment performance and apply appropriate troubleshooting techniques.
3. Interpret and use equipment diagrams, symbols, and schematics.
4. Describe principles and operations related to brewing, distillation and fermentation.

BDF 240 Seasonal Beer Production

Class: 2 Lab: 4 Credit: 4

Prerequisites: None
Corequisites: None

This course covers the brewing of seasonal and specialty beers using advanced brewing techniques. Topics include original recipe development, lab analysis, production techniques and packaging. Upon completion, students should be able to develop original recipes for seasonal and specialty beers, and provide analysis, production and packaging.

Student Learning Outcomes

1. Develop original recipes for seasonal and specialty beers.
2. Demonstrate proper lab analysis of a developmental beer.
3. Demonstrate proper advanced production techniques in the development of a seasonal/specialty beer.
4. Demonstrate proper packaging of a developmental beer.
5. Develop label and branding for a market concept for developmental beer.

BDF 250 BDF Packaging & Materials

Class: 2 Lab: 3 Credit: 3

Prerequisites: None
Corequisites: None

This course covers the practices associated with packaging including canning, bottling, box presentations and kegging of beer and distilled products. Emphasis is placed on techniques related to expansion of the product shelf life which may include container selection, temperature/light control and labeling, capping, and sealing options. Upon completion, students should be able to demonstrate and perform practical operations critical to packaging.

Student Learning Outcomes

1. Analyze the principles of counter pressure filling of carbonated and non-carbonated beverages.
2. Implement a balanced draught system as used within the beverage industry for delivering beer from a keg.
3. Examine containers commonly used for packaging fermented beverages and the impact of cost and quality of packaging materials.
4. Evaluate appropriate keg, can and bottle filling technology for packaging requirements and sanitation requirements of such technology.
5. Analyze quality control tests and measurements on finished products.

BDF 261 Bev Marketing & Sales

Class: 3 Lab: 0 Credit: 3

Prerequisites: None
Corequisites: None

This course covers the planning and resources required to market grains/hops/fruit and brewed or distilled products. Emphasis is placed on the nature of the craft beverage market including industry/consumer trends, economic, legal, and social considerations related to branding, pricing, promotion, and distribution. Upon completion, students should be able to demonstrate a basic proficiency of the marketing principles and practices for craft beverages and the grains/hops/fruit from which they are produced.

Student Learning Outcomes

1. Clarify the federal, state and local regulatory requirements related to the distribution, sale and advertisement of fermented beverages.
2. Design product placement using established techniques in merchandising, branding and advertising to maximize revenue.
3. Examine organizational sales structure and strategies to positively impact return on investment.
4. Analyze internal control systems to marketing and sales to maximize revenue and reduce risk.
5. Design training models to increase sales team leadership, management and development of accounts.

BDF 261A Bev Marketing & Sales Lab

Class: 0 Lab: 2 Credit: 1

Prerequisites: None
Corequisites: BDF 261 Bev Marketing & Sales

This course provides laboratory experience for enhancing student skills in the responsibilities and activities encountered in the marketing of grains/hops/fruits and brewed or distilled products. Emphasis is placed on the nature of the craft beverage market including industry/consumer trends, economic, legal, and social considerations related to branding, pricing, promotion and distribution. Upon completion, students should be able to demonstrate a basic proficiency of the marketing principles and practices for craft beverages and the grains/hops/fruit from which they are produced.

Student Learning Outcomes

1. Clarify the federal, state and local regulatory requirements related to the distribution, sale and advertisement of fermented beverages.
2. Design product placement using established techniques in merchandising, branding and advertising to maximize revenue.
3. Examine organizational sales structure and strategies to positively impact return on investment.
4. Analyze internal control systems to marketing and sales to maximize revenue and reduce risk.
5. Design training models to increase sales team leadership, management and development of accounts.

BDF 270 Craft Beverage Business Lab

Class: 0 Lab: 6 Credit: 2

Prerequisites: BDF 110 Fermentation Production and BDF 111 BDF Safety & Sanitation
Corequisites: BDF 115 Applied Craft Bev Microbiology

This course covers concepts of management, production, marketing and economics through hands-on experience in an on-site brewery/fermentation facility. Topics include management/control systems, marketing/distribution and product development/evaluation. Upon completion, students should be able to craft and market fermented beverages using appropriate management and production techniques.

Student Learning Outcomes

1. Demonstrate proper beverage management principles including purchasing, storage and sales.
2. Demonstrate proper usage of cost control methods for merchandise and beverages.
3. Demonstrate appropriate keg, can and/or bottle filling for packaging and sanitation requirements.
4. Operate and properly control all related production equipment and raw materials in a safe and sanitary manner.
5. Demonstrate proper marketing principles related to distribution.

REF 211 Glycol Chiller Systems

Class: 2 Lab: 4 Credit: 4

Prerequisites: None
Corequisites: None

This course introduces the fundamentals of glycol chilling equipment as found in the brewing industry. Topics include characteristics of glycol, principles of glycol chilling, the chiller, the refrigerant, glycol and piping circuits, freeze prevention, purging, and equipment flexibility. Upon completion, students should be able to describe the components, controls, and operations of glycol chilling equipment and perform basic maintenance tasks.

Student Learning Outcomes

1. Demonstrate safe practices and procedures with tools, materials, and industry accepted test equipment covered in the course.
2. Identify and explain the theory, operating principle, and components of the glycol refrigeration system.
3. Identify tools, materials, and equipment in the glycol refrigeration industry.
4. Evacuate, charge, recover, and safely operate a basic glycol refrigeration system in accordance with EPA regulations.
5. Demonstrate glycol refrigeration piping techniques.

WLD 214 Sanitary Welding

Class: 2 Lab: 6 Credit: 4

Prerequisites: None
Corequisites: None

This course covers the requirements for gas tungsten arc welding (TIG) of austenitic stainless steel tube, pipe, and plate. Topics include correct selection of tungsten, polarity, gas and proper filler rod with emphasis placed on safety, equipment set-up and welding techniques. Upon completion, students should be able to perform TIG welds with various electrodes and filler materials on austenitic stainless steel tube, pipe, and plate.

Student Learning Outcomes

1. Demonstrate the use of TIG welding on austenitic stainless steel tube, pipe and plate in compliance with AWS for the selection of electrodes.
2. Preform a grove weld of austenitic stainless steel tube, pipe and plate in accordance with AWS code.
3. Preform a fillet weld of austenitic stainless steel tube, pipe and plate in accordance with AWS code.
4 . Demonstrate safe equipment set-up, operation and shut down practices according to manufacturer's recommendations