

Course Descriptions (A-B)

AIR CONDITIONING AND REFRIGERATION (ACR)

- ACR 111 REFRIGERATION PRINCIPLES (2T, 4M) 3 credits**
FORMERLY: ACR 101
This course emphasizes the fundamental principles for air conditioning and refrigeration. Instruction is provided in the theory and principles of refrigeration heat transfer, refrigeration system components, the mechanical cycle of operation, and refrigeration characteristics. Upon completion, students should understand the functions of major systems components, terminology, heat transfer, safety, and the use and care of tools and equipment.
- ACR 112 HVACR SERVICE PROCEDURES (1T, 5M) 3 credits**
FORMERLY: ACR 120
This course covers system performance checks and refrigerant cycle diagnosis. Emphasis is placed on the use of refrigerant recovery/recycle units, industry codes, refrigerant coils and correct methods of charging and recovering refrigerants. Upon completion, students should be able to properly recover/recycle refrigerants and demonstrate safe, correct service procedures which comply with the no-venting laws.
- ACR 113 REFRIGERATION PIPING PRACTICES (1T, 2E, 3M) 3 credits**
This course introduces students to the proper installation procedures of refrigerant piping and tubing for the heating, ventilation, air conditioning and refrigeration industry. This course includes various methods of working with and joining tubing. Upon completion, students should understand related terminology, be able to identify ACR pipe and tubing, and various fittings.
- ACR 115 HEATING SYSTEMS I (2T, 4E, 6M) 6 credits**
FORMERLY: ACR 211
This course covers the fundamentals of heating systems. Emphasis is placed on components, operations general service procedures, and basic installation procedures. Upon completion, students should be able to install and service gas and electric furnaces.
- ACR 121 PRINCIPLES OF ELECTRICITY FOR HVACR (2T, 4M) 3 credits**
This course is designed to provide the student with the basic knowledge of electrical theory and circuitry as it pertains to air conditioning and refrigeration. This course emphasizes safety, definitions, symbols, laws, circuits, and electrical test instruments. Upon completion, students should understand and be able to apply the basic principles of HVACR circuits and circuit components.

- ACR 122 HVACR ELECTRICAL CIRCUITS (1T, 5M) 3 credits**
FORMERLY: ACR 133
This course introduces the student to electrical circuits and diagrams. Electrical symbols and basic wiring diagrams are constructed in this course. Upon completion, students should understand standard wiring diagrams and symbols.
- ACR 123 HVACR ELECTRICAL COMPONENTS (1T, 5M) 3 credits**
FORMERLY: ACR 212
PREREQUISITE: ACR 121
This course introduces students to electrical components and controls. Emphasis is placed on the operations of motors, relays, contractors, starters, and other HVAC controls. Upon completion, students should be able to understand motor theory and control functions in HVACR equipment.
- ACR 125 ADVANCED HEAT PUMP SYSTEMS (2T, 4E, 6M) 6 credits**
PREREQUISITE: ACR 123
This course is an in-depth study of the theory and application of heat pump systems. Topics include reverse cycle refrigeration, four-way valve operation, industry codes, system components and troubleshooting. Upon completion, students should be able to install and service heat pumps.
- ACR 126 COMMERCIAL HEATING SYSTEMS (1T, 5M) 3 credits**
FORMERLY: ACR 213
PREREQUISITE: ACR 115
This course covers the theory and application of larger heating systems. Emphasis is placed on larger heating systems associated with commercial applications such as gas heaters, boilers, unit heaters, and duct heaters. Upon completion, students should be able to troubleshoot and perform general maintenance on commercial heating systems.
- ACR 130 COMPUTER ASSISTED HVAC TROUBLESHOOTING (2E, 3M) 1 credit**
FORMERLY: ACR 232
This course focuses on troubleshooting procedures. Emphasis is placed on the proper use of test equipment and machine/electrical malfunctions. Upon completion, students should be able to diagnose and repair service problems in HVAC equipment.
- ACR 132 RESIDENTIAL AIR CONDITIONING (1T, 5M) 3 credits**
FORMERLY: ACR 131
PREREQUISITE: ACR 111 (Formerly ACR 101)
This course introduces students to residential air conditioning systems. Emphasis is placed on the operation, service, and repair of residential air conditioning systems. Upon completion, students should be able to service and repair residential air conditioning systems.

ACR 133 DOMESTIC REFRIGERATION (1T, 2E, 3M) 3 credits
PREREQUISITE: ACR 111 (Formerly ACR 101)
 This course covers domestic refrigerators and freezers. Emphasis is placed on operation, maintenance, and repair of domestic refrigerators. Upon completion, students should be able to service and repair home refrigerators and freezers. **(Taught on Demand)**

ACR 134 ICE MACHINES (1T, 2E, 3M) 3 credits
 This course introduces students to commercial ice machines. Emphasis is placed on components, electrical and mechanical operation sequences, control adjustment procedures, preventive maintenance, repairs, and installation procedures. Upon completion, students should be able to install, service and repair commercial ice machines. **(Taught on Demand)**

ACR 139 AUTOMOTIVE AIR CONDITIONING (1T, 2E, 3M) 3 credits
FORMERLY: ACR 223
 This course introduces students to the fundamentals of the automotive air conditioning systems. Emphasis is placed on service, diagnostics, repair procedures and the recovery and recycling of refrigerants. Upon completion, students should be able to service and repair automotive air conditioning systems.

ACR 144 BASIC DRAWING AND BLUEPRINT READING IN HVAC (3T) 3 credits
 This course covers basic drawing and blueprint reading as applied to the HVAC industry. Emphasis is on three-view drawings, basic duct systems, and isometric piping. Upon course completion, students should be able to perform basic drawings related to HVAC systems and read pertinent blueprints. **(Taught on Demand)**

ACR 147 REFRIGERATION TRANSITION AND RECOVERY (3T) 3 credits
 This course is EPA-approved and covers material relating to the requirements necessary for types I, II, III and universal certification. The EPA certification exam is administered at the end of the course. Upon completion, students should be able to pass the EPA refrigerant certification exam. **(Taught on Demand)**

ACR 192 HVAC APPRENTICESHIP/INTERNSHIP (15M) 3 credits
 This course is designed to provide basic hands-on experiences in the workplace. The student is provided with a training plan developed by the employer and instructor working together to guide the learning experience. Upon course completion, students should be able to work independently and apply related skills and knowledge. **(Taught on Demand)**

ACR 200 REVIEW FOR CONTRACTORS EXAM (1T, 5M) 3 credits
 This course prepares students to take the State Certification Examination. Emphasis is placed on all pertinent codes, piping procedures, duct design, load

calculation, psychometrics, installation procedures, and air distribution. Upon completion, students should be prepared to take the contractors exam. **(Taught on Demand)**

ACR 202 SPECIAL REFRIGERATION SYSTEMS (1T, 2E, 3M) 3 credits
FORMERLY: ACR 231
PREREQUISITE: ACR 111 (Formerly ACR 101)
 This course is designed to give students the basic knowledge of a variety of commercial refrigeration systems. Topics include expandable refrigeration evaporator systems, combination spray and compressor systems, open cycle ammonia, CO2 pellets, vortex tubes, reach in coolers, and soft serve ice cream machines. Upon completion, students should be able to perform general troubleshooting and maintenance on various commercial refrigeration systems.

ACR 203 COMMERCIAL REFRIGERATION (1T, 2E, 3M) 3 credits
PREREQUISITE: ACR 111 (Formerly ACR 101)
 This course focuses on commercial refrigeration systems. Emphasis is placed on evaporators, condensers, compressors, expansion devices, special refrigeration components and application of refrigeration systems. Upon completion, students should be able to service and repair commercial refrigeration systems.

ACR 204 COMMERCIAL AIR CONDITIONING (1T, 5M) 3 credits
FORMERLY: ACR 213
PREREQUISITE: ACR 111 (Formerly ACR 101)
 This course focuses on commercial air conditioning systems. Topics include maintenance, repair, and troubleshooting. Upon course completion, students should be able to service and repair commercial air conditioning systems.

ACR 205 SYSTEM SIZING AND AIR DISTRIBUTION (1T, 5M) 3 credits
FORMERLY: ACR 221 and ACR 222
 This course provides instruction in the load calculation of a structure and system sizing. Topics of instruction include heat loss, heat gain, equipment and air distribution sizing, and factors making acceptable indoor air quality. Upon course completion, students should be able to calculate system requirements.

ACR 206 SYSTEM TROUBLESHOOTING (2T, 4M) 3 credits
FORMERLY: ACR 233
 This course introduces students to various HVAC troubleshooting techniques. Emphasis is placed on mechanical and electrical problems, heat pump service, air conditioning service, and problem analysis. Upon course completion, students should be able to perform various troubleshooting techniques on heating and air conditioning systems.

Course Descriptions

ADVANCED ELECTRONICS MANUFACTURING (AEM)

AEM 100 INTRODUCTION TO ELECTRONICS MANUFACTURING (2T, 3M) 3 credits

This course is an introduction to electronics manufacturing and covers basic electricity concepts, through-hole and surface mount component identification, electrostatic discharge, materials and processes, including a basic overview of through-hole and surface mount soldering, manual cleaning, visual inspection and basic work techniques. Industry specifications and standards covered in this course will include the following:

- ESD-20-20 ANSI/ESDS20.20-1999 ESD Association Standard for the Development of an ESD Control Program
- J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies
- J-STD-002 Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires
- J-STD-003 Solderability Tests for Printed Boards
- J-STD-004 Requirements for Soldering Fluxes
- J-STD-005 Requirements for Soldering Pastes
- J-STD-006 Requirements for Electronic Grade Solder Alloys and Fluxed and Non-fluxed Solid Solders

An IPC J-STD-001 Operator Certification is included as part of this course. Successful completion of the certification testing is not a requirement for receiving credit for this class.

AEM 105 FUNDAMENTALS OF ELECTRONICS MANUFACTURING (2T, 3M) 3 credits

This is a fundamentals of electronics manufacturing course that covers printed circuit board (PCB) layout and design for manufacturability, printed circuit board manufacturing, solder paste and other materials, PCB fabrication, solder paste printing, component placement, reflow soldering and wave soldering, automated cleaning, automated inspection, in-circuit and functional test and conformal coating. Industry specifications/standards covered during this course include the following:

- IPC-A-600 Acceptability of Printed Boards
 - IPC-A-610 Acceptability of Electronic Assemblies
- An IPC-A-600 and IPC-A-610 Worker Proficiency Certification is included as part of this course. Successful completion of the certification testing is not a requirement for receiving credit for this class.

AEM 150 FUNDAMENTALS OF CABLE/HARNESS ASSEMBLY (2T, 3M) 3 credits

This is a cable/harness assembly course that covers materials and wire configurations, tools for wire preparation and assembly, stripping of insulation from conductors and cables, and general connection requirements such as marking and labeling, terminal assembly, solder connections, crimp connections, solder splices, shield terminations, tying and lacing, cable/harness protective coverings, hardware installation, solderless wrap, acceptability requirements, and

testing. Industry specification/standards covered during this course will be IPC/WHMA-A-620 Requirements for Acceptance for Cable and Wire Harness Assemblies. Students will receive an IPC Worker Proficiency Certification to IPC/WHMA-A-620 upon successful completion of this course. Successful completion of the certification testing is not a requirement for receiving credit for this class.

AEM 160 PRINCIPLES OF ELECTRONICS MANUFACTURING I (3T, 3M) 4 credits

This course covers the manufacture and assembly of electronic printed circuit boards, from component selection and board layout to soldering and testing. Special emphasis on high-volume manufacturing techniques and state-of-the-art processes, such as surface mount technology (SMT) will be covered. Laboratory projects include CAD circuit board layout, using automatic placement and soldering equipment, investigating thermal characteristics of circuit boards, process design and evaluation using SPC techniques and rework and repair. The industry specifications/standards covered during this course will include the following:

- IPC-2221 Generic Standard on Printed Board Design
- IPC-2615 Printed Board Dimensions and Tolerances
- IPC-EM-782A Surface Mount Design & Land Pattern Standard
- IPC-7711 Rework of Electronic Assemblies
- IPC-7721 Repair and Modification of Printed Boards and Electronic Assemblies

An IPC-7711/21 Operator Certification is included as part of this course. Successful completion of the certification testing is not a requirement for receiving credit for this class.

AEM 170 PRINCIPLES OF ELECTRONICS MANUFACTURING II (3T, 3M) 4 credits

This is a Principles of Electronics Manufacturing course that covers advanced packaging technologies. Topics include BGA, Flip Chip, Multi-chip module, and Chip Scale Packaging. Interconnect reliability, handling procedures, process requirements and yields for assembly, cleaning, automated inspection and testing will also be covered. Industry specifications/standards covered during this course will include the following:

- IPC/JEDEC J-STD-012 Implementation of Flip Chip and Chip Scale Technology
- IPC/JEDEC J-STD-013 Implementation of Ball Grid Array and Other High Density Technology
- IPC-MC-790 Guidelines for Multichip Module Technology Utilization
- SMC-TR-001 An Introduction to Tape Automated Bonding Fine Pitch Technology
- IPC-SC-60A Post Solder Solvent Cleaning Handbook

AEM 190 OPTOELECTRONICS (3T, 3M) 4 credits
This course covers Optoelectronic packaging technologies including active and passive components and discrete fiber cable, their characteristics, and the manner that these parts will become an integral part of the functioning module, board or sub-assembly. Topics will include technology choices, design considerations, material properties, component mounting and inter-connecting structures, assembly processes, testing, application, rework and reliability of completed optoelectronic assemblies. The industry specification/standards that will be covered during this course will be J-STD-040 Optoelectronics Assembly and Packaging Technology.

AEM 200 PROJECTS IN ELECTRONICS MANUFACTURING (2T, 6M) 4 credits
This is a capstone course in electronics manufacturing. Students will be given a printed circuit board to layout and assemble using high volume manufacturing techniques and state-of-the-art processes. They will develop test strategies and implement statistical process control in order to validate process design. At the end of the course, each student will present written and oral reports on his or her part of the project. Students will evaluate each step of the manufacturing process.

AEROSPACE TECHNOLOGY (ARS)

ARS 100 AEROSPACE PRINT READING, GD & T, PRECISION MEASURING INSTRUMENTS (3T) 3 credits
This course is designed to introduce the basic principles of print reading and design, including the English and Metric System; precision measuring equipment; Geometric Dimensioning and Tolerancing dealing with Aerospace design and tolerance fundamentals. Print reading topics include multi-view machine, welding, instrumentation, process, assembly drawings and engineering change order procedures. GD & T topics covered include symbols, terms, tolerance data frames and conversion. The precision measuring tools using hands on experience include small hand precision gages, combination square sets, dial & digital calipers, micrometer calipers, all type indicators, depth gages, vernier scale instruments, digital micro-check and ultra-sonic gages.

ARS 101 FUNDAMENTALS OF AEROSPACE MANUFACTURING (3T) 3 credits
This course will provide an in-depth study of several modern processes and materials that are used in fabricating high performance, lightweight, and reliable structures for aerospace assemblies. Several processes will be reviewed in detail. The processes will be those currently used in Aerospace and predicted for future use. Emphasis will be placed on process evaluation techniques that can be extrapolated to other areas.

ARS 104 SAFETY IN A MANUFACTURING ENVIRONMENT (3T) 3 credits
This course is an introduction to general issues, concepts, procedures, and safety standards found in an aero-

space industrial environment. This safety course is to make the Aerospace Technician aware of their changing work environment and attempt to reduce the number of industrial accidents. This course emphasizes many safety topics including general industry safety rules, personnel protective equipment, electrical & machine safety, respirators, welding & coatings safety, fall protection & elevated platforms, crane & rigging operation, forklift and tug safety, HazCom policies and MSDS documentation.

ARS 105 AEROSPACE METALLURGY AND MATERIALS (3T) 3 credits
This course will provide the student with an ability to make informed decisions in processing materials used in aerospace manufacturing, fabrication and assembly. This course will also provide an awareness of the material requirements of structures fabricated to perform in a non-terrestrial environment and an introduction to the vocabulary commonly used in Aerospace fabrication facilities.

ARS 126 AEROSPACE MACHINING FUNDAMENTALS (1T, 6M) 3 credits
COREQUISITE: ARS 100
This course is an introduction to general machining issues, concepts, procedures, and safety standards found in an aerospace industrial environment. This introduction to Aerospace Machining Fundamentals is intended to indoctrinate the Aerospace Technician in basic skills needed to operate and to perform machining functions safely and efficiently in an aerospace facility. The Aerospace Technician will be introduced to basic manual as well as introductory level CNC programming and CNC manufacturing skills to build a firm foundation as an Aerospace Machining and Fabrication Technician. Some of the study and practical experience topics are bench work, speeds and feeds, tooling applications, set-up, machine control & operations, CNC basic operations, G & M codes, tool presetting and CNC machine capabilities.

ARS 127 ADVANCED AEROSPACE MACHINING (2T, 3M) 3 credits
PREREQUISITE: ARS 126
COREQUISITE: ARS 100
This course will introduce advanced principles of aerospace machining. It is designed to build on general machining issues, concepts, procedures, and safety standards learned in the course Aerospace Machining Fundamentals. This course is intended to indoctrinate the Aerospace Technician in advanced skills needed to safely and efficiently operate machining equipment in an Aerospace Facility and other high-tech machining industries and industrial environments. This course emphasizes CNC programming, tooling and work-holding devices, organization and inventory tooling practices and work skills needed in an aerospace industrial environment.

ARS 128 CNC PROGRAMMING (2T, 3M) 3 credits
COREQUISITE: ARS 100
This course is an introduction to general CNC programming concepts, procedures and techniques found in an

Course Descriptions

COURSE DESCRIPTIONS

- aerospace industrial machining and fabricating environment. This course will train the Aerospace Technician to read, write and use the G and M code programming language to accomplish machining and fabricating hardware using state of the art CNC equipment. This course also introduces the technician to CadCam system programming found in the aerospace industry. These Cad-Cam programming skills will be used extensively through the entire aerospace machining and fabrication curriculum path. Some of the programming topics will include 3 axes mill, CNC lathe programming and applying tool path and cutter compensations.
- ARS 129 AEROSPACE BRAKE-FORMING OPERATIONS (2T, 3M) 3 credits**
COREQUISITE: ARS 100
This course is designed to educate individuals in brake forming operations, issues, concepts, procedures, and safety standards found in an Aerospace industrial environment. Brake Forming Operations is intended to supply the Aerospace Technician with advanced skills needed to operate and to perform bending and forming operations safely and efficiently in an Aerospace facility. The Aerospace Technician will be introduced to sheet metal bend programming, conversational CNC operational and manufacturing skills. This will allow the Aerospace Brake Forming Technician to become diversified in an Aerospace manufacturing environment and other high-tech industries involved in brake forming. The study includes practical experience in brake safety, tooling, maintenance, operations, press tooling applications dies, multiple set-ups, machine control & operations, slip rolling, conversational CNC control operations, generating programs, calculating set and spring back, materials and forming capabilities and bump forming.
- ARS 151 WELDING PRINCIPLES THEORY AND SYMBOLS (3T) 3 credits**
COREQUISITE: ARS 100
A beginning study of Aerospace welding processes with emphasis on equipment, gases, electric current, tooling, design, material types and welding symbols. A limited amount of manual welding is anticipated. Analysis of weldments is expected.
- ARS 152 ORBITAL TUBE WELDING (2T, 3M) 3 credits**
COREQUISITE: ARS 100
This course is a study in programmable orbital tube welding setup methods, programming methods, and safe operation of welders and tube preparation machinery. This process is a high tech application of automated TIG welding on small thin walled tubing.
- ARS 153 GAS TUNGSTEN ARC AND PLASMA WELDING AND LAB (3T, 2E) 4 credits**
COREQUISITE: ARS 100
A study of the strengths and limitations of Gas Tungsten Arc Welding (GTAW) and Plasma Arc Welding (PAW) will be made. Equipment, shielding gases, arc characteristics, filler metals, and base material will be studied. Manual welding procedures will be taught. Each student will receive a certificate stating the level of manual welding achievement.
- ARS 176 AEROSPACE ELECTRICAL/ELECTRONIC ASSEMBLY (2T, 2E) 3 credits**
COREQUISITE: ARS 100
This course is a study in the mechanics of electrical/electronic assembly used in aerospace and related manufacturing. This course will prepare the technician for the hands on part of electrical/electronic assembly, and includes basic electricity, wire types, wire gages, wire stripping methods, crimp tools, electrical connectors, electrical torquing, soldering techniques, wire harness manufacturing, and wire harness installation.
- ARS 178 AEROSPACE MECHANICAL ASSEMBLY (2T, 2E) 3 credits**
COREQUISITE: ARS 100
This course is a study of mechanical assembly processes applied in aerospace and related manufacturing industries. Topics include safety, drilling techniques, fastener installation, and related attachments.
- ARS 202 PROCESS CONTROL AND QUALITY MANUFACTURING (3T) 3 credits**
This course serves as an introduction to the basic principles of Quality management and Statistical Process Control (SPC). It inculcates the student with the concept of Lean Manufacturing reinforced with SPC applications. Objectives for students successfully completing the course are: (1) Practice the knowledge and skills to successfully apply SPC using various quality tools with the goal of improving product quality. (2) Practice the knowledge and skills needed for decision making and controlling manufacturing resources with the goal of improving efficiency and cost effectiveness. Additionally, this course is designed to enhance students' successful linkage to future certification in QA/AC.
- ARS 203 ADVANCED AEROSPACE MANUFACTURING (3T) 3 credits**
PREREQUISITE: ARS 101
The course will provide the student with an awareness of manufacturing processes and the knowledge of how to evaluate processes and materials for manufacturing stability, cost effectiveness, and inherent quality. The student will become familiar with methods to find additional technical information.
- ARS 226 HEMI-MILLING MACHINING (2T, 3M) 3 credits**
PREREQUISITE: ARS 126, ARS 127, ARS 128, ARS 227
COREQUISITE: ARS 100
This advanced course is an introduction to hemi-milling operations, machining issues, concepts, procedures, and safety standards found in an Aerospace industrial environment. This course in Aerospace hemi-milling operations is intended to indoctrinate the Aerospace Technician in advanced skills needed to operate and to perform Hemi and gantry mills safely and efficiently in an Aerospace facility. Some of the course study and practical experience include tooling and fixturing, CNC 5 axis programming, vector and polar coordinate drilling and 5 axis ISO grid opera-

tions and manipulation of multi-axis milling and drilling heads.

ARS 227 SKIN MILLING (2T, 3M) 3 credits
PREREQUISITE: ARS 126, ARS 127, ARS 128
COREQUISITE: ARS 100
 This advanced course is an introduction to skin milling operations, machining issues, concepts, procedures, and safety standards found in an aerospace industrial environment. This course in aerospace skin milling operations is intended to indoctrinate the Aerospace Technician in advanced skills needed to operate and to perform skin and gantry mills safely and efficiently in an aerospace facility. Some of the course study and practical experience topics are surface prep, material selection, tool balancing and gauging, vacuum lift and chuck operating procedures, thread hobbing and ISO grid operations and manipulation of machine control units.

ARS 228 VERTICAL TURRET LATHES (2T, 3M) 3 credits
PREREQUISITE: ARS 126, ARS 127, ARS 128
COREQUISITE: ARS 100
 This advanced course is an introduction to vertical turret lathe operations, machining issues, concepts, procedures, and safety standards found in an aerospace industrial environment. This course in aerospace Vertical Turret Lathes operations is intended to indoctrinate the Aerospace Technician in advanced skills needed to operate, and to perform Vertical Turret Lathes safely and efficiently in an aerospace facility. Some of the course study and practical experience include lathe tooling, chucking and fixturing, CNC lathe programming, turning and threading operations, boring and facing and manipulation of FANUC machine control units.

ARS 229 AEROSPACE INSPECTION PROCESSES (2T, 3M) 3 credits
COREQUISITE: ARS 100
 This course is an advanced class involving aerospace inspection processes, concepts, procedures, and safety standards found in an aerospace industrial inspection environment. This course in aerospace inspection processes is intended to indoctrinate the Aerospace Technician in advanced inspection skills needed to operate and to perform safely and efficiently in an aerospace facility. Inspection topics emphasized are vernier and micrometer instruments, gage blocks, indicators, electronic comparators, angular measurements, calibration procedures, coordinate measuring machines, theodolite and laser alignment equipment, and evaluate failure analysis procedures.

ARS 230 MACHINING AND FABRICATION PROJECT (6E) 3 credits
PREREQUISITE: Permission of Instructor
 This advanced course includes an array of cumulative skills concerning Aerospace Machining and Fabrication processes, concepts, procedures, and safety standards found in an Aerospace industrial environment. The exiting student will be required to compile, perform, execute, and produce assigned projects to prove proficiency in the specialty. Some of the study and practical experience topics are surface prep, material

selection and manipulation of machine control units, CNC Programming, Skin Milling Operations, Vertical Turret Lathe Operations, Hemi-Milling Operations and Break Press Operations and Inspection Processes. All students will be required to satisfy exit requirements to include problem solving, working in a team environment, strict enforcement of routing sheet flow of operations and present an Aerospace Portfolio in a form to satisfy program requirements. Upon completion of this course, the student will have satisfied all of the hands-on requirements included in the Aerospace Machining and Fabrication specialty pathway section of their degree program.

ARS 251 SPECIALIZED WELDING PROCESSES AND LAB (3T, 2E) 4 credits
PREREQUISITE: ARS 151 AND ARS 153
COREQUISITE: ARS 100

A study of the welding processes most commonly used in aerospace other than Arc such as Electron Beam, Ultrasonic, Pressure, Flash Butt, Inertia, Friction, Explosive, Stud, Resistance, Laser, and Diffusion Bonding will be examined.

ARS 252 WELDING INSPECTION PROCEDURES (3T, 2E) 4 credits
PREREQUISITE: ARS 151 AND ARS 153
COREQUISITE: ARS 100

The reasons for and the objective of welding inspection will be examined. A beginning understanding of visual, penetrant, ultrasonic and radiographic inspection will be studied. Defect types and effects on the hardware functional life will be examined. The critical nature of repairs will also be examined.

ARS 253 HYDROSTATIC AND PNEUMATIC PROCESSES (3T) 3 credits
COREQUISITE: ARS 100

The use of high-pressure fluids and gases to form, size, qualify and proof test small and large aerospace products will be studied. The benefits of forming into tools versus stamping or stretching will be examined. The security of final sizing and proof testing will be examined.

ARS 254 COATINGS PRINCIPLES, APPLICATION AND PROCESSES (3T) 3 credits
PREREQUISITE: ARS 151 AND ARS 153
COREQUISITE: ARS 100

A study of the processes, methods, equipment and materials for apply coatings by thermal, pneumatic and chemical means will be studied. Process analysis and final product acceptance requirements will be evaluated.

ARS 276 INSTRUMENTATION AND ATTACHMENTS (2T,2E) 3 credits
COREQUISITE: ARS 100

This course includes how thermocouples, temperature sensors, and strain gages are used in the aerospace industry and how they are installed on different types of airframes and structures. This course also includes the bonding materials, soldering techniques, and electrical testing of temperature sensors and strain gages.

Course Descriptions

COURSE DESCRIPTIONS

ARS 278 ADHESIVE BONDING (2T,2E) 3 credits
COREQUISITE: ARS 100
 This course includes mixing and applying adhesives for pressure, safety, corrosion, weather, and fuel tank sealing for various aerospace applications. This course also includes a study of why different adhesives are used and how exposure to different elements affect the adhesives.

ARS 280 SURFACE PREPARATION AND PAINTING OPERATIONS (2T,2E) 3 credits
COREQUISITE: ARS 100
 This course is a study of preparation of component surfaces for various coating and painting applications. This course also includes measurement of paint and coating thickness both wet and dry, how colors are developed, and how to operate paint booth electrical and air systems.

ARS 282 INTEGRATED ASSEMBLY PROJECT (6E) 3 credits
PREREQUISITE: ARS 152, ARS 176, ARS 178, ARS 276, ARS 278, ARS 280 AND ARS 284
 This project course will offer the student the opportunity to complete a hands-on project including all training in aerospace structures and assembly. The student will follow a work order to assemble a project that includes installing rivets, building and installing a wire harness, welding and installing stainless steel tubes, painting and installing and testing various attachments, instruments and sensors.

ARS 284 SPECIAL COATING APPLICATIONS (4T,4E) 6 credits
COREQUISITE: ARS 100
 This course is a study in special coatings for composite materials such as marshall convergent coating. This will address mixing, spraying, and curing of coating materials. This course also includes a study of how composite materials are manufactured, how composite materials are used, and why composite materials are used rather than metals.

ANTHROPOLOGY (ANT)

ANT 200 INTRODUCTION TO ANTHROPOLOGY (3T) 3 credits
 This course is a survey of physical, social, and cultural development and behavior of human beings.

ANT 210 PHYSICAL ANTHROPOLOGY (3T) 3 credits
 This course is a study of the human evolution based upon fossil and archaeological records as well as analysis of the variation and distribution of contemporary human populations.

ANT 220 CULTURAL ANTHROPOLOGY (3T) 3 credits
 This course is the application of the concept of culture to the study of both primitive and modern society.

ANT 226 CULTURE AND PERSONALITY (3T) 3 credits
PREREQUISITE: ANT 200
 This course explores the relationship between personality development and culture from a cross cultural perspective.

ANT 230 INTRODUCTION TO ARCHAEOLOGY (3T) 3 credits
 This course is an introduction to archaeological excavation techniques and post-excavation laboratory procedures.

ANT 236 FIELD SURVEY IN ARCHAEOLOGY (6E) 3 credits
PREREQUISITE: ANT 230
 This course permits students to apply archaeological techniques to field research projects.

ANT 237 ARCHAEOLOGICAL LAB PROCEDURES (6E) 3 credits
PREREQUISITE: ANT 230
 This course specializes in artifact conservation, cataloging, sorting, storage, and general post-excavation cultural material administration. Learning methodology and understanding the deterioration-susceptibility of objects.

ANT 246 PRESERVATION LAB PROCEDURES (6E) 3 credits
PREREQUISITE: ANT 230
 This course is primarily intended for students interested in pursuing museum science and archaeological laboratory procedures. It reviews technical information on curation, preservation, and conservation of physical and cultural objects.

ANT 260 INDIANS OF NORTH AMERICA (3T) 3 credits
 This course surveys the history, development, and culture of North American Indian tribes.

ART (ART)

ART 100 ART APPRECIATION (3T) 3 credits
 This course is designed to help the student find personal meaning in works of art and develop a better understanding of the nature and validity of art. Emphasis is on the diversity of form and content in original artwork. Upon completion, students should understand the fundamentals of art, the materials used and have a basic overview of the history of art.

ART 101 ART WORKSHOP I (6E) 3 credits
PREREQUISITE: Permission of instructor
 This course provides an art experience for both non-art and art majors who are interested in a variety of art projects concerned with community or college related activities. Emphasis is placed on the organization of ideas in advancing their creative process. Upon completion, students should be able to present visual evidence of the activities involved and explain how the experience advanced their artistic skills.

ART 102	ART WORKSHOP II (6E) 3 credits PREREQUISITE: Art Workshop I, Permission of instructor This course provides an art experience for both non-art and art majors who are interested in a variety of art projects concerned with community or college related activities. Emphasis is placed on the organization of ideas in advancing their creative process. Upon completion, students should be able to present visual evidence of the activities involved and explain how the experience advanced their artistic skills.	ART 126	COLOR (6E) 3 credits This course introduces the student to fundamentals of color and color uses. Topics include various color theories, technical skills in mixing color, types of pigment and the expressive uses of color. Upon completion, students should be able to explain and demonstrate a fundamental understanding of color as it is used in the development of assigned color problems.
ART 109	ART MUSEUM SURVEY (3T) 3 credits This course covers the art experience through supervised visits to museums and art galleries. Emphasis is placed on learning through critical study. Upon completion, students should be able to write a critical analysis of the artwork experienced that demonstrates an understanding of aesthetics.	ART 127	THREE-DIMENSIONAL COMPOSITION (6E) 3 credits PREREQUISITE: ART 113 or ART 121 This course introduces art materials and principles of design that acquaint the beginner with the fundamentals of three-dimensional art. Emphasis is placed on the use of art fundamentals and the creative exploration of materials in constructing three-dimensional artworks. Upon completion, students should demonstrate basic technical skills and a personal awareness of the creative potential inherent in three-dimensional art forms.
ART 113	DRAWING I (6E) 3 credits This course provides the opportunity to develop perceptual and technical skills in a variety of media. Emphasis is placed on communication through experimenting with composition, subject matter and technique. Upon completion, students should demonstrate and apply the fundamentals of art to various creative-drawing projects.	ART 133	CERAMICS I (6E) 3 credits This course introduces methods of clay forming as a means of expression. Topics may include hand building, wheel throwing, glazing, construction, design, and the functional and aesthetic aspects of pottery. Upon completion, students should demonstrate through their work a knowledge of their methods, as well as an understanding of the craftsmanship and aesthetics involved in ceramics.
ART 114	DRAWING II (6E) 3 credits PREREQUISITE: ART 113 This course advances the student's drawing skills in various art media. Emphasis is placed on communication through experimentation, composition, technique and personal expression. Upon completion, students should demonstrate creative drawing skills, the application of the fundamentals of art, and the communication of personal thoughts and feelings.	ART 134	CERAMICS II (6E) 3 credits PREREQUISITE: ART 133 This course develops the methods of clay forming as a means of expression. Topics may include hand building, glazing, design, and the functional and aesthetic aspects of pottery, although emphasis will be placed on the wheel throwing method. Upon completion, students should demonstrate improved craftsmanship and aesthetic quality in the production of pottery.
ART 121	TWO-DIMENSIONAL COMPOSITION I (6E) 3 credits This course introduces the basic concepts of two-dimensional design. Topics include the elements and principles of design with emphasis on the arrangements and relationships among them. Upon completion, students should demonstrate an effective use of these elements and principles of design in creating two-dimensional compositions.	ART 173	PHOTOGRAPHY I (6E) 3 credits This course is an introduction to the art of photography. Emphasis is placed on the technical and aesthetic aspects of photography with detailed instruction in darkroom techniques. Upon completion, students should understand the camera as a creative tool, understand the films, chemicals and papers, and have a knowledge of composition and history.
ART 122	TWO-DIMENSIONAL COMPOSITION II (6E) 3 credits PREREQUISITE: ART 121 This course covers the theory and practice of composing two-dimensional images. Emphasis is placed on the relation between the basic elements and principles of design and their impact on the visual message. Upon completion, students should, through personal expression, demonstrate an effective use of these elements and principles of design in creating two-dimensional compositions.	ART 174	PHOTOGRAPHY II (2T, 2E) 3 credits PREREQUISITE: Permission of instructor This is a sequence to Photography I and serves as an introductory photography course. Emphasis is placed on aesthetic as well as technical aspects of photography. Upon completion, the student will be able to produce well composed photographs.
		ART 176	FILMMAKING (6E) 3 credits This course provides a knowledge of the basics of filmmaking. Emphasis is placed on procedure, equipment, editing and sound. Upon completion, students

Course Descriptions

COURSE DESCRIPTIONS

	should demonstrate a basic knowledge of filmmaking through critical analysis and film projects.		
ART 177	COLOR PHOTOGRAPHY (2T, 2E) 3 credits PREREQUISITE: ART 173 or ART 176 or Permission of instructor This course covers the primary materials and processes of color photography. Emphasis is placed on the correct exposure, processing, creative color usage, and printing of both positive/negative color materials through exploration of films, filters, processes, and color temperature. Upon completion, students should be able to correctly execute the technical controls of color materials and explore the creative possibilities of color photography.		ART 204 ART HISTORY II (3T) 3 credits This course covers the chronological development of different forms of art, such as sculpture, painting and architecture. Emphasis is placed on history from the Baroque to the present. Upon completion, students should be able to communicate a knowledge of time period and chronological sequence including a knowledge of themes, styles and of the impact of society on the arts.
ART 178	AUDIO-VISUAL TECHNIQUES (1T, 2E) 2 credits This course is an exploration of the area of linkage between the visual and auditory senses. Work with sound and recording equipment, projected images and multimedia hardware and software is included. Students will produce finished multimedia pieces.		ART 216 PRINTMAKING I (6E) 3 credits This course introduces various printmaking processes. Topics include relief, intaglio, serigraphy, or lithography and the creative process. Upon completion, students should have a basic understanding of the creative and technical problems associated with printmaking.
ART 187	PHOTOGRAPHY, FILM, AND MEDIA I (1T, 2E) 2 credits PREREQUISITE: ART 173 or PFC 177 or Permission of instructor This course is designed to help the student explore creative approaches to photography, film, and related media. Problems in darkroom techniques, laboratory techniques, and special effects are included. Upon completion, the student should be able to apply these techniques to professional quality finished pieces.		ART 217 PRINTMAKING II (6E) 3 credits PREREQUISITE: ART 216 or Permission of instructor This course provides the opportunity for the student to study a printmaking process beyond the introductory level. Emphasis is placed on creativity, composition, and technique in the communication of ideas through printmaking. Upon completion, students should demonstrate an understanding of the printmaking process as a creative tool for the expression of ideas.
ART 188	PHOTOGRAPHY, FILM, AND MEDIA II (1T, 2E) 2 credits PREREQUISITE: PFC 187 or Permission of instructor This course is designed to help the student explore creative approaches to photography, film, and related media in greater depth. Problems in darkroom techniques, laboratory techniques, and special effects are included. Upon completion, the student should be able to apply these techniques to professional quality finished pieces.		ART 221 COMPUTER GRAPHICS I (6E) 3 credits This course is designed to enhance the student's ability to produce computer generated graphics. Emphasis is on the application of original design to practical problems using a variety of hardware and software. Upon completion, students should have an understanding of professional computer graphics.
ART 190	ART: LEGAL AND FINANCIAL MANAGEMENT (3T) 3 credits This course is designed to acquaint the student with funding sources, business procedures, and project planning for the visual artist. Topics may include grants, budgeting, legal contracts, and self-promotion. Upon completion, students should demonstrate a knowledge of the basics of managing an art related business.		ART 231 WATERCOLOR PAINTING I (6E) 3 credits This course introduces materials and techniques appropriate to painting on paper with water-based medium. Emphasis is placed on developing the technical skills and the expressive qualities of watercolor painting. Upon completion, students should be able to demonstrate a basic proficiency in handling the techniques of watercolor and how it can be used for personal expression.
ART 203	ART HISTORY I (3T) 3 credits This course covers the chronological development of different forms of art, such as sculpture, painting and architecture. Emphasis is placed on history from the ancient period through the Renaissance. Upon completion, students should be able to communicate a knowledge of time period and chronological sequence including a knowledge of themes, styles, and of the impact of society on the arts.		ART 232 WATERCOLOR II (6E) 3 credits PREREQUISITE: ART 231 This course advances the skills and techniques of painting on paper using water-based medium. Emphasis is placed on exploring the creative uses of watercolor and developing professional skills. Upon completion, students should demonstrate and compile a body of original paintings that reflects a personal awareness of the media's potential.
			ART 233 PAINTING I (6E) 3 credits This course is designed to introduce the student to fundamental painting processes and materials. Topics include art fundamentals, color theory, and composition. Upon completion, students should be able to demonstrate the fundamentals of art and discuss various approaches to the media and the creative processes associated with painting.

ART 234	PAINTING II (6E) PREREQUISITE: ART 233 This course is designed to develop the student's knowledge of the materials and procedures of painting beyond the introductory level. Emphasis is placed on the creative and technical problems associated with communicating through composition and style. Upon completion, students should be able to demonstrate the application of the fundamentals of painting and the creative process to the communication of ideas.	3 credits
ART 243	SCULPTURE I (6E) This course provides a study of three-dimensional form by familiarizing students with sculpting media and techniques. Topics include the fundamentals of art and sculpting media with emphasis on the creative process. Upon completion, students should understand the fundamentals of art and three-dimensional form, as well as the various media and processes associated with sculpture.	3 credits
ART 244	SCULPTURE II (6E) PREREQUISITE: ART 243 This course is designed to sharpen skills in the media and processes of sculpture. Emphasis is placed on personal expression through three-dimensional form. Upon completion, students should be able to apply the fundamentals of art, their knowledge of form, and the sculptural processes to communicating ideas.	3 credits
ART 253	GRAPHIC DESIGN I (6E) PREREQUISITE: VCM 180 or Permission of instructor This course is designed to introduce the study of visual communication through design. Emphasis is placed on the application of design principles to projects involving such skills as illustration, layout, typography, and production technology. Upon completion, students should demonstrate a knowledge of the fundamentals of art and understanding of the relationship between materials, tools and visual communication.	3 credits
ART 254	GRAPHIC DESIGN II (6E) PREREQUISITE: VCM 180 or ART 253 This course further explores the art of visual communication through design. Emphasis is placed on the application of design principles to projects involving such skills as illustration, layout, typography, and production technology. Upon completion, students should be able to apply the knowledge of the fundamentals of art, material and tools to the communication of ideas.	3 credits
ART 258	PHOTOGRAPHIC AND MEDIA PROBLEMS (1T, 2E) This course deals with special problems in the student's area of interest. Emphasis is placed on design, technique and results. Upon completion, the student will be able to produce professional quality photographs in one particular area of photography.	2 credits
ART 263	MUSEUM PRACTICE I (2-8E) PREREQUISITE: Permission of instructor This course provides an introduction to a variety of museum works, with practical training supervised by museum staff. Topics may include promotion, ship-	1-4 credits

ART 264	MUSEUM PRACTICE II (2-8E) PREREQUISITE: ART 263 or Permission of instructor This course provides further study of museum art-works, with practical training supervised by museum staff. Topics may include promotion, shipping, labeling and hanging of a museum exhibit as well as the study of the work itself. Upon completion, students should understand the activities surrounding a museum exhibit and be able to explain how the experience advanced their knowledge of communicating through art.	1-4 credits
ART 273	STUDIO PHOTOGRAPHY I (2T, 2E) This course stresses image-making problems requiring studio or other controlled environment solutions. Lights, props, and related equipment and techniques are utilized. The student will produce quality photographs using studio techniques.	3 credits
ART 274	STUDIO PHOTOGRAPHY II (2T, 2E) PREREQUISITE: PFC 273 or Permission of instructor This course deals with advanced problems requiring studio or other controlled environment solutions. Lights, props, and related equipment and techniques are utilized. The student will produce quality photographs using studio techniques.	3 credits
ART 291	SUPERVISED STUDY IN STUDIO ART I (2-8E) PREREQUISITE: Permission of instructor This course is designed to enable the student to continue studio experiences in greater depth. Topics are to be chosen by the student with the approval of the instructor. Upon completion, the student should have a greater expertise in a particular area of art.	1-4 credits
ART 292	SUPERVISED STUDY IN STUDIO ART II (2-8E) PREREQUISITE: ART 291, Permission of instructor This course is designed to enable the student to continue studio experiences in greater depth. Topics are chosen by the student with the approval of the instructor. Upon completion, the student should have greater expertise in a particular area of art.	1-4 credits
ART 293	DIRECTED READINGS IN ART I (3T) This course offers supervised readings in the literature of visual art. Emphasis is placed on in-depth analysis of the chosen area of study. Upon completion, students should have an extensive knowledge of an advanced area in art and evidence of their work in the form of research.	3 credits
ART 294	DIRECTED READINGS IN ART II (3T) PREREQUISITE: ART 293 This course offers supervised readings in the literature	3 credits

Course Descriptions

of visual art. Emphasis is placed on an in-depth analysis of the chosen area of study. Upon completion, students should have an extensive knowledge of an advanced area in art and evidence of their work in the form of research.

ART 299 ART PORTFOLIO (2-8E) 1-4 credits
PREREQUISITE: Permission of instructor
 This course is designed to help the art major in the preparation and presentation of an art portfolio. Emphasis is placed on representing the student's potential as an artist in order to interest employers, clients or schools. Upon completion, students should be able to make a professional presentation of their design and communication skills.

ASTRONOMY (AST)

AST 220 INTRODUCTION TO ASTRONOMY (3T, 2E) 4 credits
 This course covers the history of astronomy and the development of astronomical thought leading to the birth of modern astronomy and its most recent development. Emphasis is placed on the coverage of astronomical instruments and measuring technologies, the solar system, the Milky Way galaxy, important extragalactic objects, and cosmology. Laboratory is required.

BARBERING (BAR)

BAR 110 ORIENTATION TO BARBERING (3T) 3 credits
FORMERLY: BAR 101
 This course provides an orientation to professional barber-styling. Topics include professional image, basic fundamentals, and the history of barber-styling. Upon completion, the student should be able to identify the core concepts of the profession.

BAR 111 SCIENCE OF BARBERING (1T, 2E, 3M) 3 credits
FORMERLY: BAR 110
 This course introduces the student to the basic science of barber-styling. Topics include anatomy/physiology, disorders, and treatments of the skin, scalp, and hair, and theory of facial and scalp massage. Upon completion, the student should be familiar with the anatomical structures, as well as disorders and treatments of the skin, scalp, and hair.

BAR 112 BACTERIOLOGY AND SANITATION (3T) 3 credits
FORMERLY: BAR 101
 This course provides the theory of bacteriology and sanitation. Topics include the types of bacteria and sanitation procedures. Upon completion, the student should be able to identify types of bacteria and methods of sanitation.

BAR 113 BARBER-STYLING LAB (9M) 3 credits
FORMERLY: BAR 110
 This course provides practical application of barber-styling fundamentals. Emphasis is placed on the care of implements, shampooing, and haircutting. Upon completion, the student should be able to care for his/her implements properly and demonstrate the basic techniques of shampooing and haircutting with only minimal supervision.

BAR 114 ADVANCED BARBER-STYLING LAB (9M) 3 credits
FORMERLY: BAR 120
 This course provides the student with practical experience in haircutting and facial massage. Emphasis is placed on hands-on experience. Upon completion, the student should be able to demonstrate on a model the correct procedures for a facial massage and basic haircut.

BAR 120 PROPERTIES OF CHEMISTRY (3T) 3 credits
FORMERLY: BAR 102
 This course provides the student with a basic knowledge of chemicals used in barber-styling. Topics include the changes produced in the hair and skin through exposure to chemicals, electricity and special light spectrums. Upon completion, the student should understand the proper use of implements and chemicals to treat hair and skin.

BAR 121 CHEMICAL HAIR PROCESSING (9M) 3 credits
FORMERLY: BAR 130
 This course provides the student with knowledge and hands-on experience using chemicals to alter the appearance of hair. Emphasis is placed on the use of chemicals to relax, wave, and soft curl the hair. Upon completion, the student should be competent in the use of chemicals to produce desired structure changes to the hair.

BAR 122 HAIR COLORING CHEMISTRY (3T) 3 credits
FORMERLY: BAR 102
 This course provides the student with a basic knowledge of hair color alteration. Topics include temporary, semi-permanent, and permanent changes. Upon completion, the student should be able to identify and explain the procedures for each classification of hair color alteration.

BAR 124 HAIR COLORING METHODOLOGY LAB (9M) 3 credits
FORMERLY: BAR 131
 This course provides the student an opportunity for practical application of all classifications of chemical hair coloring and processing products in a supervised environment. Emphasis is placed on experience in all classifications of hair coloring and processing procedures.

BAR 130 MARKETING AND BUSINESS MANAGEMENT (3T) 3 credits
FORMERLY: BAR 105
 This course provides the student with marketing and management skills that are essential for successful

salon management. Topics include first aid, job search, bookkeeping, selling techniques, shop floor plans, shop locations, and legal regulations. Upon completion, the student should be aware of marketing and business management requirements for a successful salon.

- BAR 131** **STRUCTURE AND DISORDERS OF NAILS (1.5T, 4.5M)** **3 credits**
FORMERLY: BAR 103
This course provides the student with the knowledge of nail structure and experience in identifying nail disorders. Emphasis is placed on identifying disorders and on using the correct implements and supplies for healthy nail care and manicures. Upon completion, the student should be capable of providing professional nail care.
- BAR 132** **HAIR STYLING AND DESIGN (3T)** **3 credits**
FORMERLY: BAR 104
This course introduces the student to the art of hair style and design. Topics include the selection of styles to create a mood or complement facial features as well as hair replacement and hair pieces. Upon completion, the student should know the principles of style and design.
- BAR 133** **HAIR STYLING AND MANAGEMENT LAB (9M)** **3 credits**
FORMERLY: BAR 140
This course includes hair styling and management procedure. Emphasis is placed on styling, management, marketing, and legal regulations. Upon completion, the student should be able to integrate a variety of skills and be ready to begin an internship in a salon setting.
- BAR 140** **PRACTICUM (10M)** **2 credits**
FORMERLY: BAR 150
This course provides the student an opportunity to combine knowledge and skill covering all aspects of barber-styling in a professional setting or school lab with minimal supervision. Emphasis is placed on utilization of the knowledge and technical skills covered in the barbering/styling curriculum. Upon completion, the student should be able to function in a professional setting with very little assistance.
- BAR 141** **PRACTICUM (10M)** **2 credits**
FORMERLY: BAR 151
This course provides the student an additional opportunity to combine knowledge and skill covering all aspects of barber-styling in a professional setting or school lab with minimal supervision. Emphasis is placed on utilization of the knowledge and technical skills covered in the barbering-styling curriculum. Upon completion, the student should function in a professional setting as a productive employee or manager.

BIOLOGY (BIO)

- BIO 101** **INTRODUCTION TO BIOLOGY I (3T, 2E)** **4 credits**
Introduction to Biology I is the first of a two-course sequence designed for non-science majors. It covers historical studies illustrating the scientific method, cellular structure, bioenergetics, Mendelian and molecular genetics and a survey of human organ systems. Special attention is paid to biological information that will allow each student to live a healthier life and be better prepared to understand human activity. Laboratory is required.
- BIO 102** **INTRODUCTION TO BIOLOGY II (3T, 2E)** **4 credits**
PREREQUISITE: BIO 101
Introduction to Biology II is the second of a two-course sequence for non-science majors. It covers the theory of evolution, evolutionary principles and relationships, environmental and ecological topics, classification, and a survey of biodiversity. Each student will be prepared to make informed decisions on environmental and ecological issues. Laboratory is required.
- BIO 103** **PRINCIPLES OF BIOLOGY I (3T, 2E)** **4 credits**
This is an introductory course for both science and non-science majors. It covers physical, chemical, and biological principles common to all organisms. These principles are explained through a study of cell structure and function, cellular reproduction, basic biochemistry, cell energetics, the process of photosynthesis, and Mendelian and molecular genetics. Also included are the scientific method, basic principles of evolution, and an overview of the diversity of life with emphasis on viruses, prokaryotes, and protists. Laboratory is required.
- BIO 104** **PRINCIPLES OF BIOLOGY II (3T, 2E)** **4 credits**
FORMERLY: BIO 104 (Animal Biology) and BIO 105 (Plant Biology)
PREREQUISITE: BIO 103
This course is an introduction to basic ecological and evolutionary relationships of plants and animals and a survey of plant and animal diversity including classification, morphology, physiology, and reproduction. Laboratory is required.
- BIO 201** **HUMAN ANATOMY AND PHYSIOLOGY I (3T, 2E)** **4 credits**
PREREQUISITE: BIO 103 or successful completion of BIO 103 challenge exam.
Human Anatomy and Physiology I covers the structure and function of the human body. Included is an orientation of the human body; basic principles of chemistry; a study of cells and tissues; metabolism; joints; the integumentary, skeletal, muscular, and nervous systems; and the senses. Dissection, histological studies and physiology are featured in the laboratory experience. Laboratory is required.

Course Descriptions

COURSE DESCRIPTIONS

- BIO 202 HUMAN ANATOMY AND PHYSIOLOGY II (3T, 2E) 4 credits**
PREREQUISITE: BIO 103 and BIO 201 or BIO 103 and permission of the instructor.
 Human Anatomy and Physiology II covers the structure and function of the human body. Included is a study of basic nutrition; basic principles of water; electrolyte; acid-base balance; and the endocrine, respiratory, digestive, excretory, cardiovascular, lymphatic and reproductive systems. Dissection, histological studies, and physiology are featured in the laboratory experience. Laboratory is required.
- BIO 211 Human Anatomy and Physiology for Health Occupations I (3T, 2E) 4 credits**
PREREQUISITE: As required by the program
 This course is the first in a two-course sequence which covers the basic structure and function of the human body. Tissues and the following organ systems are covered: integumentary, skeletal, muscular, nervous, sensory, endocrine, circulatory, digestive, respiratory, excretory, and reproductive. Upon completion, students should be able to demonstrate a basic understanding of the fundamental principles of human anatomy and physiology and their interrelationships. Laboratory is required.
- BIO 220 GENERAL MICROBIOLOGY (2T, 4E) 4 credits**
PREREQUISITE: BIO 103
 This course includes historical perspectives, cell structure and function, microbial genetics, infectious diseases, immunology, distribution, physiology, culture, identification, classification, and control of microorganisms. The laboratory experience includes micro-techniques, distribution, culture, identification, and control. Laboratories are required.
- BIO 240 FIELD BIOLOGY (3T, 2E) 4 credits**
FORMERLY: BIO 280
PREREQUISITE: BIO 103
 This course covers basic principles of taxonomy, classification, and selected ecological concepts. Animal and plant diversity is emphasized through collection, identification, and museum preparation of local flora and fauna. Laboratory is required.
- BIO 250 DIRECTED STUDIES IN BIOLOGY (2-8E) 1-4 credits**
FORMERLY: BIO 296
PREREQUISITE: Permission of instructor
 This course is designed for independent study in specific areas of biology chosen by the student in consultation with a faculty member and carried out under faculty supervision.
- BIO 251 DIRECTED STUDIES IN BIOLOGY (2-8E) 1-4 credits**
PREREQUISITE: BIO 250 and Permission of instructor
 This course is designed for independent study in specific areas of biology chosen by the student in consul-

tation with a faculty member and carried out under faculty supervision.

- BIO 286,287 FIELD STUDIES IN PLANT ECOLOGY I and II (1-2T, 2-4E) 2-4 credits each**
PREREQUISITE: Permission of instructor
 These courses introduce a strong field component into our Biology program and expose students to unique ecosystems like the Great Smoky Mountains National Park and the Chihuahuan Desert of Big Bend National Park in western Texas. These laboratory intensive courses introduce plants in selected communities and emphasize identification, sampling and collecting techniques in the field.
- BIO 288, 289 FIELD STUDIES IN MARINE BIOLOGY I and II (1-2T, 2-4E) 2-4 credits each**
PREREQUISITE: Permission of instructor
 These laboratory intensive courses introduce salt water and marsh environments with emphasis on vertebrates. Pertinent ecological concepts are introduced using sampling, collecting, preserving, and identification techniques. These courses are offered for students to obtain first hand field experience in marine ecosystems especially on the Gulf Coast. In the past students have studied Marine Biology at the Dauphin Island Sea Lab, the Florida State University Marine Laboratory, Dog Island Sound/St. George Island, taken sampling excursions in the Gulf of Mexico aboard research vessels, and studied ornithology and salt water marshes on the Mississippi Sound coastline.

BASIC SKILLS READING (RDG)

- RDG 085 DEVELOPMENTAL READING (3T) 3 credits**
 This course is designed to improve reading and critical thinking skills. Topics include vocabulary enhancement; extracting implied meaning; analyzing author's purpose, tone, and style; and drawing conclusions and responding to written material. Upon completion, students should be able to comprehend and analyze college-level material.

BASIC STUDY SKILLS (BSS)

- BSS 100 STUDY SKILLS (1T) 1 credit**
 This course is intended for those who placed into credit-level course work but who are not maintaining satisfactory academic progress toward meeting program goals. Topics include study skills, note taking, learning styles and strategies, test taking, goal setting, and self-assessment skills. Upon completion, students should be able to manage their learning experiences to successfully meet educational goals.

BSS 118 STUDY SKILLS (1T) 1 credit
This course covers skills and strategies designed to improve study behaviors. Topics include time management, note taking, test taking, memory techniques, active reading strategies, critical thinking, communication skills, learning styles, and other strategies for effective learning. Upon completion, students should be able to apply appropriate study strategies and techniques to the development of an effective study plan.

BUSINESS (BUS)

BUS 100 INTRODUCTION TO BUSINESS (3T) 3 credits
This is a survey course designed to acquaint the student with American business as a dynamic process in a global setting. Topics include the private enterprise system, forms of business ownership, marketing, factors of production, personnel, labor, finance, and taxation.

BUS 147 INTRODUCTION TO FINANCE (3T) 3 credits
This course is a survey of monetary and credit systems. Topics include the role of the Federal Reserve System, sources of capital including forms of long-term corporate financing, and consumer credit in the financial structure of our economy.

BUS 150 BUSINESS MATH (3T) 3 credits
This course is a study of practical business mathematics. Topics include fundamental processes of arithmetic with emphasis on decimals and percentages, markup, discounts, bank reconciliation, simple and compound interest, discounting notes, depreciation methods, and present value.

BUS 177 SALESMANSHIP (3T) 3 credits
This course provides an introduction to the principles and practices of ethical salesmanship. Topics include industrial and retail selling methods of market analysis, professional salesmanship and sales methods, consumer types, attitudes, and behavior.

BUS 190 MANAGEMENT WORKSHOP (1-3T) 1 - 3 credits
This course is a part of a series of workshops wherein current topics of interest are presented. They are offered upon demand and can be tailored to the needs of individuals, business and industry.

BUS 190B PROBLEM SOLVING (1T) 1 credit
The goal of this course is to help students improve problem-solving skills. Emphasis is placed on developing the five-step process for problem solving: Defining the Situation, Stating the Goal, Identifying a Solution, Preparing a Plan, and Taking Action.

BUS 190C TEAMBUILDING (1T) 1 credit
The goal of this course is to help students identify factors and develop the skills necessary for becoming part of a successful team. Emphasis is placed on developing skills in communication, shared leadership, and conflict resolution.

BUS 190D SELF-MANAGEMENT (1T) 1 credit
The goal of this course is to help students build skills necessary to take responsibility and adjust to the changing demands of the workplace. Emphasis is placed on developing abilities to adjust to new technologies or processes, upgrading skills, career planning, and personal transitions.

BUS 190E EMPLOYABILITY SKILLS (1T) 1 credit
The goal of this course is to help students develop skills to make them more employable. Emphasis is placed on developing a professional resume and cover letter, organizing a job search campaign, interviewing, resigning from a position, and accepting new positions.

BUS 190F ORGANIZATIONAL COMMUNICATIONS (1T) 1 credit
The goal of this course is to help students build personal skills that allow them to communicate effectively in the workplace. Emphasis is placed on verbal, non-verbal, and written communications as they relate to professional work habits.

BUS 190G INTERPERSONAL RELATIONS FOR MANAGEMENT (1T) 1 credit
The goal of this course is to help students achieve better interpersonal relationships on the job. Emphasis is placed on the concepts of professional treatment of customers, managing diversity, commitment to quality, managing office politics, developing positive attitudes, and self-discipline.

BUS 190H TIME/PROJECT MANAGEMENT (1T) 1 credit
The goal of this course is to assist students in developing effective time management skills. Emphasis is placed on learning to set priorities, making decisions, delegating, concentrating on specific tasks, and increasing personal productivity.

BUS 190I DIRECTED READINGS IN MANAGEMENT (1T) 1 credit
The goal of this course is to allow students to research a current topic of interest. Topics chosen should benefit the student's professional development or allow for gathering beneficial research for the student's place of work.

BUS 190J ETHICS IN THE WORKPLACE (1T) 1 credit
The goal of this course is to allow students to explore the arena of ethics in the workplace. Emphasis is placed on ethics case studies.

BUS 190K STRESS MANAGEMENT (1T) 1 credit
This course is designed to help students develop skills in managing stress associated with careers in business. Emphasis is placed on developing coping skills such as conflict resolution, delegation, and identifying problems early to avoid unnecessary stress.

BUS 190L DEVELOPING A BUSINESS PLAN (1T) 1 credit
This course is designed to give students the opportunity to develop a personal business plan. The course focuses on the following areas: purpose of a business

Course Descriptions

plan, mechanics of writing a business plan, components of a business plan, and research techniques.

agement as it relates to small and self-owned businesses. Emphasis is placed on planning, organizing, and controlling.

BUS 190M EVALUATING THE ENTREPRENEURIAL PERSONALITY (1T) 1 credit
This course is designed to allow students to identify in themselves and others characteristics that are favorable for the successful entrepreneur. Self-analysis and a study of entrepreneurial traits are included.

BUS 190W CUSTOMER SERVICE STRATEGIES (1T) 1 credit
This course is an overview of the principles of customer service. Emphasis is placed on determining elements of customer satisfaction, creating a customer-focused culture, soliciting and using customer feedback, and building a "relationship" with the customer.

BUS 190N FINANCING AN ENTREPRENEURIAL ENTERPRISE (1T) 1 credit
This course is designed to inform students about the options available for financing an entrepreneurial enterprise. The course allows students to investigate possible sources of financing and to study topics such as break-even analysis, fixed and variable costs, and financial statements.

BUS 190X WORKPLACE READINESS (1-3T) 1-3 credits
This course is designed to assess students' workplace skills and help them identify areas of weakness. Skills assessment tools such as WorkKeys will be utilized. Other components of workplace readiness will be included as needed.

BUS 190P PLANNING FOR SUPERVISING HUMAN RESOURCES (1T) 1 credit
This course is designed to offer insight into the employee relation side of conducting business. Emphasis is placed on identifying employment needs, training, supervising, and motivating employees.

BUS 190Y LEADERSHIP SKILLS (1T) 1 credit
This course is an overview of the characteristics of leadership. Emphasis is placed on what effective leaders do, leadership styles, and the differences between leadership and management.

BUS 190Q PLANNING MARKET STRATEGY (1T) 1 credit
This course is designed to allow owners of businesses to develop a market strategy. Included is a discussion of market analysis, competition, sales and distribution, and pricing strategies.

BUS 193 BUSINESS CO-OP I (1T) 1 credit
PREREQUISITE: Successful completion of two (2) business courses
This course is part of a series wherein the student works in a degree/program related job. Emphasis is placed on student's work experience as it integrates academic knowledge with practical application through exposure to business and related practices in the working environment. The grade is based on the employer's evaluation of each student's productivity, content of a descriptive report submitted by the student, and student development and assessment of a learning contract.

BUS 190R PROMOTIONAL STRATEGIES (1T) 1 credit
This course allows students to look specifically at two kinds of promotional strategies: Advertising and Public Relations. Students explore how each of these strategies strongly affects the success of a business.

BUS 190S CHOOSING A LOCATION FOR A BUSINESS (1T) 1 credit
This course is designed to help students planning to start their own business to choose a suitable location and facility. Course content focuses on site location, purchasing or leasing an existing facility, and arranging layout.

BUS 194 BUSINESS CO-OP II (1T) 1 credit
PREREQUISITE: BUS 193
This course is a part of a series wherein the student works in a degree/program related job. Emphasis is placed on student's work experience as it integrates academic knowledge with practical application through exposure to business and related practices in the working environment. The grade is based on the employer's evaluation of each student's productivity, content of a descriptive report submitted by the student, and student development and assessment of a learning contract.

BUS 190T STATISTICAL PROCESS CONTROL (SPC) - VARIABLE DATA (1T) 1 credit
This course covers descriptive statistics, types of data, and how to calculate, plot, and analyze various variable charts such as average and range, median and range, and standard deviations. Variable charts are used with measurable data.

BUS 195 BUSINESS CO-OP III (1T) 1 credit
PREREQUISITE: BUS 194
This course is a part of a series wherein the student works in a degree/program related job. Emphasis is placed on student's work experience as it integrates academic knowledge with practical application through exposure to business and related practices in the working environment. The grade is based on the employer's evaluation of each student's productivity, content of a descriptive report submitted by the student, and student development and assessment of a learning contract.

BUS 190U STATISTICAL PROCESS CONTROL (SPC) - ATTRIBUTE DATA (1T) 1 credit
This course addresses the development of non-measurable data into attribute charts for analysis of a process capability. Type of charts covered are P, NP, C and U with emphasis given to development of P-type charts.

BUS 190V MANAGEMENT FOR ENTREPRENEURS (1T) 1 credit
This course is an overview of the principles of man-

BUS 196 BUSINESS CO-OP IV (1T) 1 credit
PREREQUISITE: BUS 195
 This course is a part of a series wherein the student works in a degree/program related job. Emphasis is placed on student's work experience as it integrates academic knowledge with practical application through exposure to business and related practices in the working environment. The grade is based on the employer's evaluation of each student's productivity, content of a descriptive report submitted by the student, and student development and assessment of a learning contract.

BUS 197 BUSINESS CO-OP V (1T) 1 credit
PREREQUISITE: BUS 196
 This course is a part of a series wherein the student works in a degree/program related job. Emphasis is placed on student's work experience as it integrates academic knowledge with practical application through exposure to business and related practices in the working environment. The grade is based on the employer's evaluation of each student's productivity, content of a descriptive report submitted by the student, and student development and assessment of a learning contract.

BUS 215 BUSINESS COMMUNICATIONS (3T) 3 credits
PREREQUISITE: ENG 101
 This course covers written, oral, and nonverbal communications. Topics include the application of communication principles to the production of clear, correct, and logically organized faxes, e-mail, memos, letters, resumes, reports and other business communications.

BUS 241 PRINCIPLES OF ACCOUNTING I (3T) 3 credits
 This course is designed to provide a basic theory of accounting principles and practices used by service and merchandising enterprises. Emphasis is placed on financial accounting, including the accounting cycle, and financial statement preparation and analysis.

BUS 242 PRINCIPLES OF ACCOUNTING II (3T) 3 credits
PREREQUISITE: BUS 241
 This course is a continuation of BUS 241. In addition to a study of financial accounting, this course also places emphasis upon managerial accounting, with coverage of corporations, statement analysis, introductory cost accounting, and use of information for planning, control, and decision making.

BUS 246 ACCOUNTING ON THE MICROCOMPUTER (3T) 3 credits
PREREQUISITE: BUS 241
 This course utilizes the microcomputer in the study of financial accounting principles and practices. Emphasis is placed on the use of software programs for financial accounting principles. Upon completion of this course, the student will be able to use software programs for financial accounting applications.

BUS 248 MANAGERIAL ACCOUNTING (3T) 3 credits
PREREQUISITE: BUS 241
 This course is designed to familiarize the student with management concepts and techniques of industrial accounting procedures. Emphasis is placed on cost behavior, contribution approach to decision-making, budgeting, overhead analysis, cost-volume-profit analysis, and cost accounting systems.

BUS 253 INDIVIDUAL INCOME TAX (3T) 3 credits
 This course is intended to familiarize the student with the fundamentals of the federal income tax laws with primary emphasis on those affecting the individual. Emphasis is placed on gross income determination, adjustments to income, business expenses, itemized deductions, exemptions, capital gains/losses, depreciation, and tax credits. Upon completion of this course, the student will be able to apply the fundamentals of the federal income tax laws affecting the individual.

BUS 261 BUSINESS LAW I (3T) 3 credits
 This course provides an overview of legal principles affecting businesses. Topics include contracts, agency and employment, negotiable instruments, bailments and sale of goods.

BUS 262 BUSINESS LAW II (3T) 3 credits
 This course is a continuation of BUS 261. Topics include legal principles related to partnerships, corporations, real property and leases, insurance, security devices, bankruptcy, trust and estates; government regulations of business and labor; civil and criminal liability; and business security.

BUS 263 THE LEGAL AND SOCIAL ENVIRONMENT OF BUSINESS (3T) 3 credits
 This course provides an overview of the legal and social environment for business operations with emphasis on contemporary issues and their subsequent impact on business. Topics include the



Course Descriptions

COURSE DESCRIPTIONS

	Constitution, the Bill of Rights, the legislative process, civil and criminal law, administrative agencies, trade regulations, consumer protection, contracts, employment and personal property.		
BUS 271	BUSINESS STATISTICS I (3T) PREREQUISITE: MTH 100 or appropriate score on math placement test	3 credits	
	This is an introductory study of basic statistical concepts applied to economic and business problems. Topics include the collection, classification, and presentation of data, statistical description and analysis of data, measures of central tendency and dispersion, elementary probability, sampling, estimating and introduction to hypothesis testing.		
BUS 272	BUSINESS STATISTICS II (3T) PREREQUISITE: BUS 271	3 credits	
	This course is a continuation of BUS 271. Topics include sampling theory, statistical inference, regression and correlation, chi square, analysis of variance, time series index numbers, and decision theory.		
BUS 275	PRINCIPLES OF MANAGEMENT (3T)	3 credits	
	This course provides a basic study of the principles of management. Topics include planning, organizing, staffing, directing, and controlling with emphasis on practical business applications.		
BUS 276	HUMAN RESOURCE MANAGEMENT (3T)	3 credits	
	This course provides an overview of the responsibilities of the supervisor of human resources. Topics include the selection, placement, testing, orientation, training, rating, promotion, and transfer of employees.		
BUS 279	SMALL BUSINESS MANAGEMENT (3M)	3 credits	
	This course provides an overview of the creation and operation of a small business. Topics include buying a franchise, starting a business, identifying capital resources, understanding markets, managing customer credit, managing accounting systems, budgeting systems, inventory systems, purchasing insurance, and the importance of appropriate legal counsel.		
BUS 280	INDUSTRIAL MANAGEMENT (3T)	3 credits	
	This course provides an overview of management in an industrial setting. Topics include operations analysis, research and development, physical facilities, production planning, productivity improvement, product flow, quality control, jobs and wages, and employee motivation.		
BUS 285	PRINCIPLES OF MARKETING (3T)	3 credits	
	This course provides a general overview of the field of marketing. Topics include marketing strategies, channels of distribution, marketing research, and consumer behavior.		
BUS 291	ALTERNATING BUSINESS CO-OP I (1-3T)	1-3 credits	
	PREREQUISITE: Permission of instructor This two-course sequence allows students to alternate semesters of full-time work in a job closely related to the student's academic major with semesters of full-time academic work. Emphasis is placed on a student's work experience as it integrates academic knowledge with practical applications in the business environment. The grade is based on the employer's evaluation of student productivity, evaluative reports submitted by the student, and the development and assessment by the student of a learning contract.		
BUS 292	ALTERNATING BUSINESS CO-OP II (1-3T)	1-3 credits	
	PREREQUISITE: Permission of instructor This two-course sequence allows students to alternate semesters of full-time work in a job closely related to the student's academic major with semesters of full-time academic work. Emphasis is placed on a student's work experience as it integrates academic knowledge with practical applications in the business environment. The grade is based on the employer's evaluation of student productivity, evaluative reports submitted by the student, and the development and assessment by the student of a learning contract.		
BUS 296	BUSINESS INTERNSHIP I (3T)	3 credits	
	PREREQUISITE: Minimum 6 semester hours completed. Minimum GPA 2.0 (C) This two-course sequence allows the student to work part-time on a job closely related to his or her academic major while attending classes on a full-time basis. Emphasis is placed on a student's work experience as it integrates academic knowledge with practical applications in the business environment. The grade is based on a term paper, job-site visits by the instructor, the employer's evaluation of the student, and the development and assessment by the student of a learning contract.		
BUS 297	BUSINESS INTERNSHIP II (3T)	3 credits	
	PREREQUISITE: Minimum 6 semester hours completed. Minimum GPA 2.0 (C) This two-course sequence allows the student to work part-time on a job closely related to his or her academic major while attending classes on a full-time basis. Emphasis is placed on a student's work experience as it integrates academic knowledge with practical applications in the business environment. The grade is based on a term paper, job-site visits by the instructor, the employer's evaluation of the student, and the development and assessment by the student of a learning contract.		