North Carolina A&T State University
School of Technology

Department of Applied Engineering Technology

Undergraduate Course Descriptions

AET 100. Orientation to Technology
Credit 1(1-0)
An overview of the School of Technology and its programs are explained along with what is expected of majors, their preparation, and the opportunities available upon graduation. Basic concepts such as dependability, dedication, technical knowledge, communications, cooperativeness, self-motivation, and dressing for success are discussed. (F;S)

AET 110. Blueprint Reading and Interpretation
Credit 3(1-4)
This course trains students with the basic skills needed to read and interpret industrial blueprints. Emphases are measurement unit systems and their conversions, industrial blueprint production and interpretation, information tracing through blueprint title block and notes, and converting blueprint objects to marketable products through manufacturing sequencing. Fundamental skills will also be introduced, such as lettering, sketching, dimensioning and representing common geometrical entities with points, lines, planes, and solids, orthogonal projection, sectional and auxiliary views, oblique and isometric representation. (F;S)

AET 121. Computing Technology
Credit 3 (2-2)
This course is designed to provide basic computer knowledge and skills required in a typical manufacturing environment. Emphasis will be placed on the basics of computer structure and circuitry, software programming and applications in manufacturing process including ladder logic, materials requirement planning (MRP) and statistical process control (SPC). (F;S)

AET 191. Introduction to Manufacturing Processes
Credit 3(2-2)
This course provides an introduction to basic manufacturing processes to include forming, separation conditioning, and assembly processes. An overview of production management and metrology is introduced. (F;S)

AET 200. Technology Seminar
Credit 2(0-2)
This course is designed to review and acquaint students with the necessary skills to present themselves and their credentials to various groups. Video/oral presentations as well as written and computer generated graphic presentations will be made. Prerequisite: Sophomore Standing. (F;S)

AET 201. Computer Aided Manufacturing
Credit 3(2-2)
This course introduces the basic principles of graphic design and common tools utilized in product design and product manufacturing enterprises. Geometric dimensioning and tolerancing practices and procedures are emphasized. Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) tools and techniques are presented. (F;S;SS)

AET 202. Parametric Modeling
Credit 3(2-2)
This course focuses on development of knowledge and skills associated with the parametric-based approach to modeling. Emphasis will be placed on the creation of part models and common downstream Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) processes. Rapid prototyping and common production tooling and techniques are introduced. Prerequisite: AET 201. (F;S;SS)

AET 205. Mechanical Design and Manufacturing Problems
Credit 3(2-2)
This is a basic course in mechanical design, problems and manufacturing procedures. Course includes machine-tool-die design using CAD/CAM software to generate machine codes and parts drawing. Prerequisite: Sophomore Standing. (F;S)

AET 225. Sustainability and Energy Conservation Technologies
Credit 3(3-0)
This course introduces various alternative energy resources, and sustainability and energy conservation issues. Topics include alternative energy resources, management processes needed to maximize renewable/non-renewable energy resources, economics of sustainability, and reduction of environmental impacts. Upon completion, students should be able to discuss evaluation of energy resources, efficiency, environmental impacts of energy, sustainability metrics, and energy sources. Prerequisite: Sophomore Standing. (F;S)

AET 231. Human Resources in Manufacturing
Credit 3(3-0)
This course introduces students to the current human resource issues in manufacturing industries. These include human resource needs in the new manufacturing environment involving steps in providing appropriate human resources, recruitment process, training, performance appraisal, legislation issues, and workforce diversity. Prerequisite: Sophomore Standing. (F; S)
AET 232. Manufacturing Planning and Management  
This course includes a practical approach to management to include organizing, planning, controlling and development of operations used in decision making and problem-solving in a manufacturing environment. Prerequisite: Sophomore Standing or consent of the instructor (F;S)

AET 233. Assets Maintenance  
This course introduces students to the concepts and practices in the area of maintenance. The topics include breakdown maintenance; preventive maintenance; infant mortality of components; repair capability; redundancy; reliability; and interdependency of operators, machines, and mechanics. (F; S)

AET 251. Dimensional Metrology  
This course covers dimensional metrology terminology, measurement of surface texture, flatness, squareness, angles, roundness, and concentricity. Areas of study include contact and non-contact measuring methods and equipment performance. (F;S)

AET 254. Automation Identification and Bar Coding  
The science of measurement, inspection and bar coding through automation will be covered. (F;S)

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AET 270. Industrial Materials & Processes  
This course emphasizes the nature, origin and the conversion into manufactured goods of metals, plastics, woods, ceramics, composites and synthetic materials. (F;S)

AET 271. Metallic Material Processes  
This course is a study of metallic material properties, fabricating equipment and methods utilized in the production of metallic products. (F;S)

AET 273. Numerically Controlled Machines  
Basic manufacturing processes with computer-numerically controlled (CNC) machine-tools will be covered. Course includes programming and machine language. Prerequisite: Sophomore Standing. (F;S)

AET 274. Polymer Process  
This course introduces the properties and application of polymers in manufactured products, and provides experience with injection molding, extrusion, blow molding, rotational casting thermoforming, and other basic plastics processes through laboratory exercises. Also topics in tooling design of injection molds, compression molds and dies will be discussed. Prerequisite: Sophomore Standing. (F;S)

AET 276. Introduction to PLC’s  
This course introduces the basics of programmable logic controllers (PLC). It describes the components, functions, operation, methods of programming, timers and counters and some applications of PLCs. (F;S)

AET 277. Electronics Manufacturing Technology I  
This course covers the basics in design and fabrication of electronic components. Topics include properties of materials and chemicals used in electronics manufacturing, passive and active devices, thin and thick film and IC technologies, crystal growth and water preparation and contamination control. Prerequisites: PHYS 252, MATH 111, ECT 299. (F;S)

AET 281. Industrial Statistics and Probability  
This course covers the standard introductory topics, including descriptive statistics, probability, confidence intervals, hypothesis tests, linear regression and basic techniques and methods to collect and analyze the industrial data. (F; S)

AET 293. Power Technology  
Basic concepts of energy and power technology, including mechanical, hydraulics, pneumatics and electrical methods of transmitting and controlling power sources will be covered. (F;S)

AET 311. Lean Manufacturing  
This course introduces manufacturing students to the concept of lean manufacturing, and how lean manufacturing system can facilitate continuous improvement in quality and productivity. This includes the pull method of work flow, consistent quality, small lot size, uniform workstation loads, standardized components and work methods. Other concepts include close supplier ties, flexible work force, line flows, automation, preventive maintenance, and just-in-time (JIT) philosophy. Prerequisite: Junior Standing. (F; S)

AET 325. Solar Power Technology  
This course is an introduction to solar power technology. Topics include diffuse and intermittent sources of sunlight, the conversion of sunlight into electricity using the physics of the photovoltaic effect in photovoltaic cells, the integration of solar power plants into the electrical grid and solar energy systems economics. Student will be able to
select proper components for a photovoltaic system based on regulatory codes and standards and individual component specifications, and identify the applications of solar energy. Prerequisite: AET 225. (F)

AET 326. Bio-Fuel Technologies Credit 3(3-0)
This course provides an in-depth study of commercial biofuels production and various methods for manufacturing biofuels at a large scale. Topics include government policies and standards regarding bio-fuel products, production technologies, feedstock selection and pretreatment, quality control, energy balance, and biofuels business models. Upon completion students should possess a practical knowledge of commercial biofuels production and facility operation. Prerequisite: AET 225. (S)

AET 332. Manufacturing-Production and Control Credit 3(3-0)
This course provides a comprehensive study of manufacturing operation and production control. It includes materials handling and just-in-time manufacturing (JIT), manufacturing requirement planning and continuous flow manufacturing. Prerequisite: Sophomore Standing or consent of the instructor. (F;S)

AET 361. Non-Destructive Evaluation (NDE) Technology I Credit 3(3-0)
This course presents the popular “big five” NDE technologies (liquid penetration, magnetic particle testing, x-ray radiography, ultrasonic testing, and eddy-current testing). For each of these technologies, a series of topics will be discussed; physical principles, testing procedures, application areas, equipment, instruments, data acquisitions, data analysis, flaw indication, advantages and limitations. Prerequisite: Junior Standing. (F; S)

AET 373. Advanced CNC-Machines Credit 3(1-4)
This course provides study in advanced numerically controlled (CNC) machine-tool technology with precision work performed on lathes, milling machines, laser cutters, and surface drilling workstations. Prerequisite: AET 273. (F;S)

AET 377. Electronics Manufacturing Technology II Credit 3(2-2)
This course is a continuation of AET 350 and covers topics such as devices and integrated circuit formation processes, ion implantation, photolithography, deposition, materialization, wafer testing and evaluation, through hole and surface mount components, and soldering techniques. Prerequisite: AET 277. (F;S)

AET 381. Metallurgy Credit 3(2-2)
Metals, their properties, selection, and production are studied. Phase diagram, thermal treatment and strengthening mechanisms are discussed. Lab exercises will cover specimen preparations, metallography techniques, and microstructural analysis. (F;S)

AET 392. Statics for Technology Major Credit 3(3-0)
This course is a study of static equilibrium conditions and mechanical behavior of materials under loading. Applications are made in the area of bars, columns, joint pressure vessels, shafts and beams. Testing materials for measuring mechanical properties will be experienced. Prerequisite: Junior Standing. (F;S)

AET 395. Statistical Process/Quality Control Credit 3(2-2)
This course emphasizes a practical approach to quality control in industries. Includes quality and process improvement through measurement analysis and diagnosis utilizing basic concepts of statistics. (F;S)

AET 398. Cooperative Training in Industry I Credit 3(3-0)
Students must be in industry full time for one semester in their major field of work and complete any University co-op requirements. The student will be evaluated on reports from industry. The report will be in standard format. The hours earned will be credited towards required technical electives in the industrial technology curriculum. Three sememter hours are the maximum to be earned under this arrangement in any one semester. Six semester hours are the maximum to be earned in the co-op arrangement in the Industrial Technology curriculum. Prerequisite: Junior Standing. (F;S; Summer)

AET 421. Manufacturing Decision Making Credit 3(3-0)
This course introduces the basic concept of the decision-making process in manufacturing industry. Different methods of quantitative analysis techniques will be discussed, including their application and interpretation in manufacturing industry. Prerequisite: Junior Standing. (F;S)

AET 425. Wind and Wave Energy Technologies Credit 3(3-0)
This course will discuss concepts of wind and wave energy, its reliability, economics and environmental implications. Various aspects of turbine technologies and their development will be addressed. Students will be expected to carry out research and present reports on selected turbines, energy applications and operating principles. Prerequisite: AET 225. (F)

AET 426. Fuel Cell System Technology Credit 3(3-0)
This course addresses the fundamental process and materials aspect of fuel cell technology, the reforming of hydrocarbon fuels to hydrogen, and the application of fuel cell for transportation. The course includes a review and discussion of various types of fuel cells, materials properties of electrodes and polymeric membranes, and electrochemical mechanisms. Reforming of various types of hydrocarbon fuel to hydrogen and the application of reforming technology to stationary and vehicle fuel cells will be discussed. Prerequisite: AET 225. (S)

AET 427. Hybrid Energy System Technology Credit 3(3-0)
This course discusses the underlying fundamentals of all the major energy storage methods and combining multiple power systems to build economic and sustainable resource to cover various load demands. Student will learn the principles involved in the storage of energy in mechanical, electrostatic and magnetic systems for various applications. The course also intends to strengthen student's knowledge of hybrid electric components in the hybrid electric vehicle powertrain system, including electric energy storage (batteries, flywheels, ultra-capacitors) and electrical energy production-fuel cells. Prerequisite: AET 225. (F,S)

AET 432. Industrial Productivity Measurement and Analysis Credit 3(3-0)
This course introduces the methods of work measurement and analysis towards establishing work standards and productivity level in manufacturing environment. Prerequisite: Junior Standing. (F; S)

AET 440. Thermal and Vibration Analysis and Testing of Electronic Components Credit 3(3-0)
This course covers topics in electronic components testing including failure mode, overheating, thermal stress and vibration analysis. Environmental stress screening including thermal and vibration cycling will also be studied. Prerequisite: Senior Standing. (F; S)

AET 441. Industrial Robotics Credit 3(3-0)
This course introduces the main components of industrial robots. Topics include: classifications, geometry, safety, power sources, drive systems, work envelope and ISO Standards. Prerequisite: Senior Standing and AET491. (F; S)

AET 445. Industrial Project Management Credit 3(3-0)
This course provides the students with the theory and core methodology to manage projects or participate on project teaMST including techniques and methods to break down the chaos of an overwhelming workload into manageable elements - scope, time, cost, quality, human resources, communication, risk, procurement, and integration, and to effectively manage their time by identifying goals, creating daily plans, and recognizing obstacles. Prerequisite: Senior standing. (F; S)

AET 450. Electronic Components Packaging Credit 3(2-2)
This course addresses basic issues in electronics packaging of single chip to multi-chip modules. Topics such as packaging process, clean room, bonding and sealing, and final packaging will be discussed. Student projects will include design, construction, and testing of packages for basic electronic components. Prerequisite: AET 377. (F;S)

AET 461. Non-Destructive Evaluation (NDE) Technology II Credit 3 (2-2)
This course introduces the newly developed NDE technologies, such as acoustic emission techniques, magnetic flux leakage techniques, radiographic and microwave techniques. For each of technique, a series of topics covering physical principles, testing procedures, data collection and analysis, and applications will be introduced. Prerequisite: AET 361. (F; S)

AET 474. Automated Manufacturing Credit 3(1-4)
This course provides a basic understanding of automation and its various applications in manufacturing. Implications of Computer Integrated Manufacturing (CIM) and robotic work cells towards improving productivity are emphasized. (F;S)

AET 475. Ceramic Materials Credit 3(2-2)
In this course students will be introduced to different ceramic materials and their thermal, mechanical and chemical properties. Applications in different industries including high tech semiconductors, military and space will be discussed. Prerequisite: Junior Standing. (F;S; Summer)

AET 476. Composite Material Fabrication Credit 3(3-0)
This course introduces the students to the concept of composite materials; the constituent materials of composites; the application areas of composite materials; and the advantages and disadvantages of composite materials. The core contents of this course are the fabrication technologies to make various composite materials, such as, manual lay-up, automated tape lamination, vacuum bagging, filament winding, pultrusion, matched-die molding, resin-transfer molding, spray-up methods, and many others. Other important issues, such as quality assurance, damage control, and repair, will also be discussed. (F;S)

AET 477. Piezoelectric Materials Credit 3(3-0)
This course introduces the basic concepts of piezoelectric materials, which have a capacity to complete a fundamental process of electro-mechanical interaction that represents a linear coupling in energy conversion. The applications of piezoelectric materials are presented, such as, ultrasonic generators, filters, sensors, and actuators. Prerequisite: Junior Standing. (F;S; Summer)

AET 481. Supply Chain Management Systems Credit 3(3-0)
This course introduces to students the functionalities and execution of Supply Chain Management (SCM) systems. In addition, it shows how information technology and Internet can be integrated into manufacturing management process. Prerequisite: Junior Standing. (F; S)

AET 482. Six Sigma Applied to Manufacturing Credit 3(3-0)
This course introduces manufacturing students to the concept of Six Sigma, the impact of Six Sigma on the quality of manufacturing industries, and the relationship between Six Sigma strategy and total quality management. Prerequisite: AET 395. (F; S; SS)

AET 483. Enterprise Resource Planning Systems Credit 3(3-0)
This course introduces students to seamless integration of all the information flow through a company. Topics include financial and accounting information, human resource and customer information, product planning, parts purchasing, maintaining inventory, and tracking orders. Prerequisite: Junior Standing. (F; S; SS)

**AET 484. Manufacturing Execution System**
Credit 3(3-0)
This course introduces students to the Manufacturing Execution System (MES) functionalities including machines start-up procedures, product-making process, parts measurements and inventory availability. Prerequisite: Junior Standing. (F; S)

**AET 490. Independent Study**
Credit 3(3-0)
The student selects a technical problem in his major area for special research and study in consultation with a faculty member in his area of interest. He will spend a minimum of six hours per week in library research or laboratory experimentation. A technical report in standard format will be required for completion and must be approved by two department faculty members. Prerequisite: Junior Standing. (F; S; SS)

**AET 491. Electro-Mechanical Control Systems**
Credit 3(1-4)
This course is a general study of electromechanical control systems. Emphasis will be placed on programming PLC’S, robots and interfacing sensors, transducers, etc., with other components for output signals. PC computers will be an integral part of this class. Prerequisite: AET276, AET293. (F; S; SS)

**AET 492. Mechanics of Materials for Technology Major**
Credit 3(3-0)
This course introduces the mechanical behavior of materials under loading. The concepts of stress and strain, and the relationship between external loads and materials deformation are presented. Applications are made in the area of bars, columns, joint pressure vessels, shafts and beams. Testing materials for measuring mechanical properties will be experienced. Prerequisite: AET 392. (F;S)

**AET 493. Fundamentals of Dynamics and Kinematics for Technology Major**
Credit 3(3-0)
This course introduces various principles of kinematics and kinetics of particles and rigid bodies. Emphasis is placed on understanding and analyzing various mechanisms and their motion types. Newton’s laws in various coordinator systems, and analysis of the relationship among displacement, velocity, acceleration, and the external load conditions, and how these principles should be used in industrial machines and motorsports vehicles. Prerequisite: AET 392. (F;S)

**AET 494. Leadership For Total Quality Management**
Credit 3(3-0)
This course introduces with the basic concepts and approaches related to the subject of total quality management. These includes quality and global competitiveness, strategic management, and ethics, partnering and strategic alliances, quality culture, customer satisfaction and retention, employee empowerment, teamwork, communication and interpersonal relation, education and training. Prerequisite: AET 395. (F; S)

**AET 496. AET Capstone Class**
Credit 3(3-0)
This course is a comprehensive AET required course for all manufacturing students before their graduation. This course is project oriented. The project may be chosen from all concentration areas within the department with all aspects of the manufacturing principles and practices implemented into a selected project. A final report must be completed and approved. Prerequisite: Senior standing. (F;S; Summer)

**AET 498. Cooperative Training in Industry II**
Credit 3(3-0)
The description of this course is the same as MANU 497: Cooperative Training in Industry I, and is normally the second co-op experience of the student. Prerequisite: AET 497. (F;S; Summer)

**Motorsports Courses**

**MST 251. Introduction to Motorsports**
Credit 3(2-2)
This course provides an introduction to the history, structure and organization of motorsport; overview of the various types of races, vehicles, venues and sanctioning bodies of motorsports. Students learn the racing rules, and regulations, and point systems governing various classes of racing, emphasizing the ethical and legal responsibility of motorsport industry. Students research various career paths in motorsport industry and functions of motorsport facilities. (F;S)

**MST 252. Engine Performance**
Credit 3(2-2)
This course is a study of the principles of the internal combustion engine. Students learn to identify different engine types and components, chemistry of combustion, fuel systems, and exhaust systems. Basic functions of engine design are examined with an emphasis on those aspects that enable improved engine performance, such as, spark timing, valve timing, A/F ratio, engine geometry, fuel type, manifold tuning, cooling and lubricating systems. Students practice engine assembly maintenance and trouble shooting. Prerequisite: PHYS 225/226. (F;S)

**MST 255. Automotive Powertrain Technology**
Credit 3(2-2)
This course will have in-depth discussions on a variety of manual and automatic power transmission and drive train components including drive shafts, universal joints, gears, axles, differentials, bearing, clutches and seals. Modern automatic transmissions that heavily rely on control technologies are presented, including step gear transmissions (ATs), continuous
variable transmissions (CVTs) and hybrid power train systems. Students will also practice proper service procedures for diagnosis, disassembly and assembly of manual transmissions, transfer cases and differentials. (F;S)

**MST 275. Motorsports Performance Technology Technology**  
Credit 3(2-2)

This course teaches students the technologies required for improving motorsport performance, such as, racing vehicle structural integrity (crashworthiness, structural strength and stiffness, aerodynamic characteristics performance); driver and track safety equipment; tire technology, suspension system analysis, damper analysis, aerodynamics and dynamic testing, drivers perspective, performance modeling and the race modeling. (F;S)

**MST 452. Motorsport Management**  
Credit 3(2-2)

This course prepares students to operate a successful motorsports team. Students learn how to manage motorsport businesses strategically; create and sustain competitive advantage; plan marketing and positioning of sponsorship, raise capital and handle budgeting and finance. Students investigate the integration of management principles through assessment and evaluation of a series of motorsport case studies. (F;S)

**MST 455. Motorsports Data Acquisition and Controls**  
Credit 3(2-2)

Students learn to develop understanding of the automotive electrical system, operation and components; principles of operation of fuses, relays, solenoids and actuators, fuel injectors, electric motors, ignition coils, batteries; engine electronics, function of components; minimizing the environmental impact of the internal combustion engine by using electronic control. Introduction to hybrid (full and mild), electric, fuel cell vehicles and their environmental benefits will also be presented. (F;S)

**MST 456. Vehicle Dynamics and Control**  
Credit 3(2-2)

Students will learn the fundamental dynamic considerations that influence the performance of ground vehicles. Load transfer during braking, acceleration, and cornering are analyzed. Students will investigate vehicle handling as it directly relates to chassis, suspension components, springs and shocks, tires and the overall race set up. Different types of suspension and dampers to compare their influence on transferring the vehicle loads to the road and limitation on the vehicle performance. (F;S)