

## 1 Course Content

### 2.1 Islamic Studies & Professional Ethics

CODE & TITLE (AUH-113) Islamic Studies & Professional Ethics	CREDIT & CONTACT HOURS (3+0) 48 Theory + 0 Lab	KNOWLEDGE AREA/ DOMAIN Civilization-I	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Recite</b> Holy Quran with correct pronunciation.	C-1	SA-12
<b>CLO-2</b>	<b>Apply</b> understanding of basic concepts of teaching of Islam (faith, pillars, Dawit, preaching and Seerat).	C-3	SA-8
<b>CLO-3</b>	<b>Produce</b> compilation of the Holy Quran and Basic Concepts of Hadith.	A-2	SA-8
<b>CLO-4</b>	<b>Present</b> Islam as a complete code of life.	A-3	SA-12
<b>Course Outline</b>			
<p><b>History of Islam:</b> Compilation of the Holy Quran and Hadith, Fundamental doctrines of Islam i.e., Tawheed, oneness of Allah, Prophet hood, the day of Judgment, Revealed books, Ibadaat (worship) Philosophy of Ibadaat, Namaz, Zakat, Hajj &amp; Sawm, Importance of preaching of Islam, its needs and effects, Difficulties in the ways of preaching of Islam, sectarianism, its causes and effects in Muslim society, definition of Right, classification of Right, importance of Rights, Khutba Hajjatul Wida (last address of the Holy Prophet (Peace and blessings be upon him), Seeratun-Nabi (Peace be upon him).</p> <p><b>Life of Holy Prophet (Peace be upon him):</b> The life of the Holy Prophet before and after prophet hood. The Hijra (Migration to Madina), Treaty of Al Madina, Makki and Madani life of Holy Prophet Muhammad (Peace be upon him), importance of peace and causes of terrorism.</p> <p><b>Islam and Civilization:</b> Definition of civilization, Impacts of Islamic civilization on the Sub-continent, international impacts of Islamic civilization, Impacts of Human thoughts, social and humanistic effects, Importance of Ethics, Human rights (Hoqooq Ul Ibad) with detail.</p> <p><b>Knowledge and Islam:</b> Definition of Knowledge, Classification of knowledge, Importance of technology in the light of Holy Quran and Sunnah, relevant verses of the Holy Quran about Technology (Baqara 28,30,33,201, Nahal:76, Jasia: 13, Araf: 32, Noor: 55 etc), Islamic and scientific knowledge.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. A Guidebook for Muslims, by Syed. Abul Hasan Ali Nadvi. (Latest Edition)</li> <li>2. What is Islam? by Maulana Manzoor Nomani. (Latest Edition)</li> <li>3. Hameed Ullah Muhammad, "Introduction to Islam"</li> <li>4. Hussain Hamid Hasan, "An Introduction to the study of Islamic Law", Leaf Publication, Islamabad</li> <li>5. Islamiyat (A standard book for CSS), Prof. Dr. Arif Naseem. (Latest Edition).</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.2 Functional English

COURSE CODE & TITLE (AUE-212) Functional English		CREDIT & CONTACT HOURS (2+0) 32 Theory + 0 Lab Sessions		KNOWLEDGE AREA/ DOMAIN Expository Writing – EI	
<b>After completion of this course students will be able to:</b>				<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Show</b> the proficiency and accuracy of the target language to use it effectively as a tool to succeed in academic activities.	C-3		SA-10	
<b>CLO-2</b>	<b>EmSAy</b> reading skills that are coincided with study skills directly required by students as basic skills to pursue other subjects more meaningfully.	C-2		SA-12	
<b>CLO-3</b>	<b>Illustrate</b> different genre of writing to enhance their writing skills and make use of them in their academic activities.	C-4		SA-10	
<b>Course Outline for Theory</b>					
<p><b>Greetings, Reading Skills Importance &amp; Strategies:</b> Previewing, reading practice through variety of reading texts and comprehension exercises, Skimming &amp; Scanning, Summarizing.</p> <p><b>Types of Listening:</b> active, content, critical, selective Problems in listening and coping strategies, listening skills and sub skills, Note Taking, Techniques for taking notes from lectures, from books, different forms paragraphs, points, figures, processes, tables, graphs, Vocabulary Development, Inferring meaning from context, Process of Writing and in formal Writing strategies.</p> <p><b>Writing Correctly:</b> sentence structure and punctuation, error correction, Paragraphs writing, Unity, adequate development and coherence in paragraphs.</p> <p><b>Essays:</b> Types of essays: narrative, descriptive, argumentative.</p> <p><b>Structure of Essays:</b> thesis statement and the paragraphs, informational and analytical reports, Letters: routine requests and intimation, invitation, thank you and condolence letters etc, Presentation skills</p>					
<b>Recommended Books</b>					
1. Kakarla, Gupta, Pundir, Functional English for Communication, Sage.					



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.3 Calculus and Analytical Geometry

COURSE CODE & TITLE (AUQ-112) Calculus and Analytical Geometry	CREDIT & CONTACT HOURS (2+0) 32 Theory + 0 Lab	KNOWLEDGE AREA/ DOMAIN Quantitative Reasoning-I	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Apply</b> techniques of differentiation and integration for solving problems.	C-3	SA-1
<b>CLO-2</b>	<b>Solve</b> vector calculus and analytical geometry in multiple dimensions for investigation of different technology problems.	C-3	SA-2
<b>Course Outline for Theory</b>			
<p>Basic definition of derivative, differentiation of different functions, rule of differentiation, chain rule implicit differentiation, Applications: slope, equation of tangent and normal. maxima, minima and point of inflection. Indefinite integral, different technique or integration i.e., integration by parts, integration by substitution, by partial fraction, integration of different trigonometric identity. Define definite integral: Application of definite integral, i.e., Area under the curve. Area between the curve, mean value theorem, finding the volume by slicing, volume of solid revolution Disk and Washer method, moment and center of mass etc. Vector in space, vector calculus, Divergence, curl of vector field, Directional derivatives, multivariable function Partial derivatives, Spherical, polar, cylindrical coordinates. Vector in plane: Dot product and cross products, line and plane in space. Application: work, angle between two vectors, Area of triangle, Area of parallelogram etc.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. H. Anton, I. C. Bivens, S. Davis, "Calculus, Early Transcendental", John Wiley, New York 11th edition, 2016.</li> <li>2. James Stewart, Essential Calculus, Cengage, 2nd Edition</li> <li>3. G. B. Thomas, A. R. Finney, "Calculus", Pearson, USA, 14th edition 2017.</li> <li>4. Erwin Kreyszig, Advanced Engineering Mathematics, Willey, 10th Edition</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.4 Applied Physics

CODE and TITLE (AUN-113) Applied Physics		CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab	KNOWLEDGE AREA/ DOMAIN Natural Science-I	
<b>After completion of this course students will be able to:</b>			<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the fundamental principles of physics.		C-2	SA-1
<b>CLO-2</b>	<b>Solve</b> problems of mechanics, electricity and waves.		C-3	SA-2
<b>CLO-3</b>	<b>Demonstrate</b> principles of physics through laboratory apparatus.		P-3	SA-5
<b>Course Outline</b>				
<p><b>Mechanics:</b> Definitions of Work, Energy &amp; Power, Work Energy Theorem and its applications, Mechanical Energy of System, Conservation of Mechanical Energy, practice problems, Gravitational potential energy, Hooks Law &amp; restoring force, Review of angular variables, K.E. Energy of Rotation and moment of Inertia, Torque and Newton's 2<sup>nd</sup> law of rotation, Work and Rotational K.E., Angular momentum, Angular Momentum for System of Particles.</p> <p><b>Electricity:</b> Basic terms &amp; definitions; Electric Forces and Fields, Electric flux and Coulomb's Law, Electric field due to the Point and Various charges, Gauss' law and its application, Conductors in Electric Fields, Parallel Metal Plates, Capacitance, Resistance, Electric Potential and potential energy, Ohm's Law.</p> <p><b>Waves and Oscillations:</b> Periodic motion &amp; Simple Harmonic Oscillation (SHO), Simple Pendulum, Transverse &amp; Longitudinal Waves, Speed of a traveling Wave, Damped Harmonic Oscillator, EM waves.</p>				
<b>Sample Lab Experiments</b>				
<p>To investigate the properties of series combination of Capacitors. To determine the given resistance by leakage method using ballistic Galvanometer. To study the variation of Photoelectric current with intensity of incident beam. To determine the temperature coefficient of resistance of coil by wheat stone bridge. To study Ohm's law. To investigate the properties of Series Combination of Resistances. To investigate the properties of Parallel combination of Resistances. Practical Demonstration of Ampere Law. Practical Demonstration of Faraday Law. To demonstrate the function of transformer as Step Up and Step-Down Transformer.</p>				
<b>Recommended Books</b>				
<ol style="list-style-type: none"> <li>1. Halliday and Resnick and Walker, 2018, Fundamentals of Physics, Latest Edition, Wiley.</li> <li>2. Hugh D. Young and R. A. Freedman, University Physics. (Latest Edition).</li> <li>3. Raymond A. Serway and John W. Jewett, Jr. Physics for Scientists and Engineers with modern Physics, (Latest Edition).</li> </ol>				



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.5 Computer Fundamentals

COURSE CODE & TITLE (AUC-112) Computer Fundamentals	CREDIT & CONTACT HOURS (1+1) 16 Theory + 16 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Computer Science – I	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the computer fundamentals.	C-2	SA-1
<b>CLO-2</b>	<b>Dissemble</b> and <b>assemble</b> computer components.	P-4	SA-1
<b>CLO-3</b>	<b>Demonstrate</b> the use Application and Productivity Software.	C-3	SA-5
<b>Course Outline for Theory</b>			
<p><b>Introduction to Computer:</b> Functional Block Diagram, History, Evolution, Input Devices, Output Devices, Audio input/output, Storage Devices, Memory and Memory Management, Motherboard and components, CPU, GPU, Binary numbers and working of 8088 microprocessors, Cabinet, Power supply and UPS, Device Drivers, Internet and Networking, Operating Systems, Application and Productivity Softwares,</p> <p><b>Controllers:</b> Keyboard, Interrupt &amp; DMA Controller, Clock Generator &amp; Bus Controller, Math Co-processor, Hard Disk Drive and Controller, Display Controller, Serial Interface, Parallel Interface &amp; Printer Port, Universal Serial Bus (USB).</p>			
<b>Lab Outlines</b>			
<p>Introduction to various components of PC computer, Disassembling Computer Components, Assembling Computer Components, Assembling PC computers for customers with different needs, installing a motherboard and attach power supply, and all other connectors. Checking of power supply. Installing RAM and Hard disk. Use of different ports, Device Drivers, Networking, Internet, Intranet and Search Engines, Introduction to micro-programming, Use of Application and Productivity Software.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Andrew S. Tanenbaum, 2013, Structured Computer Organization, Latest Edition, Pearson.</li> <li>2. Minasi, Wempen, and Doctor, 2005, The Complete PC Upgrade and Maintenance Guide, Latest Edition, Sybex.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.6 Technical Drawing

COURSE CODE & TITLE (AUT-112) Technical Drawing	CREDIT & CONTACT HOURS (0+2) 0 Theory + 96 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Foundation-I	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Draw</b> geometric curves, simple machine parts, sections, development of surfaces and assembly drawings.	P-3	SA-1
<b>CLO-2</b>	<b>Interpret</b> working drawings for components and assemblies.	C-3	SA-2
<b>Lab Outlines</b>			
<p>Introduction to drawing instruments, safety guidelines, layout, Lettering, Free-hand Sketching, Scaling, and line types. Hands on practice of Geometric drawings, Drawing Sheet Planning, Orthographic Projections (1<sup>st</sup> and 3<sup>rd</sup> Angle). Practice projections and surface development. Practice and drawing of three views of different objects using orthographic projection. Conversion of orthographic projection into isometric view. Creating drawings of engineering fasteners like rivets, cotter joints, threads, etc. Introduction to Geometric Dimensioning and Tolerances. Practice of various Assembly Drawings.</p>			
<b>Sample Experiments</b>			
<ul style="list-style-type: none"> <li>• Introduction to drawing instruments and their uses and safety guidelines</li> <li>• Introduction to Sheet Layout and Free-hand Sketching</li> <li>• Introduction to Lines, Lettering and Scaling</li> <li>• Practice of Dimensioning and lettering</li> <li>• Hand on practice of Geometric drawings</li> <li>• Practice on Sheet Planning</li> <li>• Practice of Sectioning and its various types</li> <li>• Creating drawings of engineering fasteners like rivets, cotter joint, threads etc.</li> <li>• Practice Assembly Drawing</li> <li>• Practice Assembly Drawings for instruction manuals</li> <li>• Practice Installation Assembly Drawing</li> <li>• Construction of multi view different types of Bearing</li> <li>• To create the 2D drawing for screw jack</li> <li>• To create the 2D drawing for different types of joint</li> <li>• To create the 2D drawing for different types of coupling</li> <li>• Development of prisms, cylinders, cones, pyramids</li> <li>• To create the 2D drawing for connecting rod, Engine Piston, Shaft, Cams</li> </ul>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Bhutt, N.D., Engineering Drawing, Latest Edition, Charotar Publishing House, 2010.</li> <li>2. Bertoline, Gary; Wiebe, Eric; Hartman, Nathan; Ross, William, McGraw-Hill Education, Latest Edition.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

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3. Parkinson, A.C., First Year Engineering Drawing, Latest Edition, Pitman Publishing.
4. Frederick E. Giesecke, Alva Mitchell, Henry C. Spencer, Ivan L. Hill, John T. Dygdon, James E. Novak, R O. Loving, Shawna E. Lockhart, Cindy Johnson, Marla Goodman, Technical Drawing with Engineering Graphics, Latest Edition.



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.7 Pakistan Studies

COURSE CODE & TITLE (AUH-133) Pakistan Studies	CREDIT & CONTACT HOURS (3+0) 48 Theory + 0 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Civilization – II	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Discuss</b> Pakistan movement, political and constitutional history of Pakistan.	C-2	SA-1
<b>CLO-2</b>	<b>Recognize</b> the importance of ethical commitment in complying international agreements and its impact on foreign policy of Pakistan.	A-2	SA-1
<b>CLO-3</b>	<b>Analyze</b> the contemporary problems faced by Pakistan in meeting Sustainable Development Goals of UN.	C-4	SA-4
<b>Course Outline for Theory</b>			
<p>Ideology of Pakistan definition and elucidation, historical aspects: Muslim rule in the Sub-continent, its downfall and efforts for Renaissance. Ideology of Pakistan in the light of Speeches and statements of Allama Iqbal and Quaid i Azam Muhammad Ali Jinnah. Land and people of Pakistan - Geography, Society, Natural resources, Agriculture, Industry, and education with reference to characteristics, trends, and problems. Pakistan and Changing Regional Apparatus.</p> <p>Regional Economic Cooperation (SAARC, ECO, SCO) and the Role of Pakistan Economic Challenges in Pakistan Non-Traditional Security Threats in Pakistan: Role of Non-State Actors Changing Security Dynamics for Pakistan: Challenges to National Security of Pakistan Political Evolution Since 1971 Foreign Policy of Pakistan Post 9/11 Ethnic Issues and National Integration, Pakistan's Energy Problems and their Effects Pakistan's Relations with Neighbors, Kashmir Issue, Economic Conditions of Pakistan, the Most Recent Economic Survey, the Previous and Current Budgets, and the Problems and Performance of Major Sectors of Economy, The Prevailing Social Problems of Pakistan and the Strategies to Deal with Them, Poverty, Education, Health and Sanitation.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. The Future of Pakistan, Cohen Stephen P. et al. Washington: Brookings Institute Press, 2011.</li> <li>2. Modern South Asia: History, Culture, Political Economy, Jalal, Aisha and Bose, Sugata. New York: Routledge, 1998.</li> <li>3. Kashmir in Conflict: India, Pakistan and the Unending War, Schofield, Victoria. New York: I.B.Tauria, 2003.</li> <li>4. A Brief History of Pakistan, Wynbrandt, James. New York: Infobase Publishing, 2009.</li> </ol>			





## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.8 Differential Equations

COURSE CODE & TITLE (AUQ-122) Differential Equations	CREDIT & CONTACT HOURS (2+0) 32 Theory + 0 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Quantitative Reasoning-II	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Solve</b> differential equations of first and higher-order homogenous and non-homogenous differential equations.	C-3	SA-2
<b>CLO-2</b>	<b>Analyze</b> linear differential equations using the Laplace transform technique and power series methods.	C-4	SA-4
<b>Course Outline for Theory</b>			
<p>Basic concept of differential equation, i.e., Definition, order, degree, and geometric meaning of Diff: equation. Solution of First order Diff Equation: Separable of equation, Exact Diff: Equation, integrating Factor, Linear ODEs. Second and higher order Differential Equation: Homogenous linear ODE with constant coefficient, Cauchy Euler Equation. Non homogenous Equation by undetermined coefficient, by variation of parameter and similar higher order Diff. equation. Finding Laplace and inverse Laplace of different functions, S- shafting theorem, solution of differential equation using Laplace transform. Basic concept of power series, Radius of convergence, convergence interval, using power series method to find the solution of Differential Equation.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley 2014</li> <li>2. W. E. Boyce, R. C. DiPrima, "Elementary Differential Equations and Boundary Value Problems, 10th edition", John Wiley &amp; Sons, Inc., 2012</li> <li>3. D. G. Zill, M. R. Cullen, "Differential Equations with Boundary-Value Problems", 10th edition, Brooks/Cole, 2013</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.9 Probability and Statistics

COURSE CODE & TITLE (AUN-123) Probability and Statistics	CREDIT & CONTACT HOURS (3+0) 48 Theory + 00 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Natural Sciences-II	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Calculate</b> the descriptive statistics and visualize statistical data.	C-3	SA-2
<b>CLO-2</b>	<b>Calculate</b> probability for discrete and continuous distributions.	C-3	SA-2
<b>CLO-3</b>	<b>Use</b> statistical software for visualization and calculating statistical parameters.	C-3	SA-5
<b>Course Outline for Theory</b>			
Visualizing statistical data, measures of central tendency and dispersion, counting methods, Conditional probability, law of total probability, Bayes theorem, Skewness and Kurtosis, Random variables, Discrete and continuous probability distribution, Probability distributions, Expectation and Variance, Correlation and simple regression.			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Introduction to Probability and Statistics, Latest Edition, by William Mendenhall, Robert J. Beaver, Barbara M. Beaver.</li> <li>2. An Introduction to Probability Theory and Its Applications, Latest Edition, by William Feller.</li> <li>3. Applied statistics and probability for engineers, Latest Edition by Douglas C Montgomery.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.10 Workshop Practice

COURSE CODE & TITLE (AUT-122) Workshop Practice	CREDIT & CONTACT HOURS (0+2) 0 Theory + 96 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Foundation-II	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Appreciate</b> the aspects of health & safety while performing workshop activities.	A-2	SA-7
<b>CLO-2</b>	<b>Demonstrate</b> the use of tools and equipment in workshop practices.	P-4	SA-1
<b>CLO-3</b>	<b>Develop</b> models of the given component using different workshop tools and machines.	P-3	SA-3
<b>Course Outline for Theory</b>			
<p>Basic introduction to fundamentals of safety precautions in workshop practices, machine operations, and tools utilization. Woodworking technology, tools, and applications for pattern making. Understanding and applications of different measuring and gauging instruments. Performing foundry operations such as forging and casting. Hands-on joining operations such as different welding processes, fastening, riveting and adhesive bonding. Basics of lathe &amp; milling operations, drillings, and cutting, etc. Basics electrical connections and tools. Basic tools used in automotive service.</p>			
<b>Lab Outlines</b>			
<ul style="list-style-type: none"> <li>• To Understand of basic Safety guidelines, tools and gadgets</li> <li>• To Familiarize with types of cutting tools and tool holders used with a standard centre lathe machine</li> <li>• To Understand of pattern making procedure and perform wood working</li> <li>• To Practice pattern making for different mechanical components</li> <li>• To Practice boring operation on the lathe machine</li> <li>• To produce internal threads on components using different methods</li> <li>• To produce external threads on components using different methods</li> <li>• To Identify and familiarization of various types of milling cutters</li> <li>• To understand the parts and accessories of a universal milling machine.</li> <li>• To manufacture a given component for the practice of Milling operations (side milling, end milling, slot milling, engraving) on a universal milling machine.</li> <li>• To Familiarize with the parts, accessories, cutting tools and operations of a shaper machine</li> <li>• To Join two metals parts using different mechanical fastening techniques and welding technology</li> <li>• To Understand the Basic fundamental of foundry processes</li> <li>• To produce a given mechanical components using casting, forging and finishing process</li> </ul>			



## Curriculum for Bachelor of Automotive Engineering Technology

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### Recommended Books

1. Krar Steve F., Check Albert F., Machine Tools, Latest Edition, McGraw-Hill, 1998.
2. Workshop Technology by Hajira Chohdry, Latest Edition.
3. Chapman W.A.J. "Workshop Technology (Part I, II & III).
4. Manufacturing Technology By M.L Begeman, Hazel Hours, Latest Edition.
5. Fundamentals of Modern Manufacturing, Latest Edition By M.P. Groover HT John Wiley & Sons.



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.11 Introduction to Automotive Systems

COURSE CODE & TITLE (AUT-133) Introduction to Automotive Systems	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Automotive Technology Foundation-III	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Identify</b> different automotive systems and their main parts and assemblies.	C-2	SA-1
<b>CLO-2</b>	<b>Interpret</b> specifications of a vehicle and its main components as given by the manufacturer.	C-3	SA-1
<b>CLO-3</b>	<b>ExSAre</b> features and characteristics of modern vehicles.	A-3	SA-2
<b>CLO-4</b>	<b>Identify</b> physically the different automotive systems, components, interior and exterior parts, sub-assemblies and assemblies.	P-2	SA-1
<b>Course Outline for Theory</b>			
<p><b>Introduction:</b> Introduction and Significance, Brief History of Automobiles, Automobiles and Human Ease of Transportation, Automobile Types and Usages, Service Tools.</p> <p><b>Basic Configuration:</b> Automotive Design Configuration, Working for Each Machine, Mechanism and Components, Automotive Effects on Environment.</p> <p><b>IC Engine Working:</b> Engine Types &amp; Classification, Engine Cycles, Basic Engine Design, Fuel System, Ignition System, Lubrication and Cooling System, Power Generation, Engine Emissions.</p> <p><b>Structure and Design:</b> Automotive Chassis, Design &amp; Importance, Materials for Chassis, Construction of Chassis and Applications.</p> <p><b>Placement of Machines and Body Configuration:</b> Assembly and Working, Body Design Basics, Wheels, tyres and Steering.</p> <p><b>Drive and Performance:</b> Automobile Drive and Performance, Suspension and Brakes.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Introduction to Automotive Technology by J. R. Daines, P. R. Rickert &amp; R. D. Brown.</li> <li>2. Automotive Technology: A Systems Approach by J. Erjavec.</li> <li>3. Automotive Technology by J. D. Halderman.</li> </ol>			



Curriculum for  
**Bachelor of Automotive Engineering Technology**

**Course Content**

**2.12 Automotive Production Technology**

COURSE CODE & TITLE (AUT-142) Automotive Production Technology		CREDIT & CONTACT HOURS (2+0) 32 Theory + 0 Lab sessions	KNOWLEDGE AREA/DOMAIN  Automotive Technology Foundation-IV	
<b>After completion of this course students will be able to:</b>			<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the basic manufacturing processes used in automotive production facility.		C-2	SA-1
<b>CLO-2</b>	<b>Apply</b> the design considerations for the manufacturing processes of automotive components.		C-3	SA-3
<b>CLO-3</b>	<b>Appreciate</b> the use of modern manufacturing techniques.		A-3	SA-5
<b>Course Outline for Theory</b>				
<p><b>Design Basics:</b> Faces and Interaction of Design Process, Design Considerations, Design Tools and Resources, Standards and Codes, Economics, Safety and Product Reliability, Stress and Strength.</p> <p><b>Manufacturing Processes:</b> Forging, Sand Casting, Die casting, Welding, Soldering.</p> <p><b>Machining Operation and Tools:</b> Types of Drill and Lathe Machines, Conventional and Non-Conventional Machining, Classification of Conventional and Non-Conventional Machines, Time calculation for Lathe Operations (Turning, Step Turning, Facing, Machining), Time Calculation for Drilling Operation, Time Calculation for Face &amp; End Milling Operation.</p> <p><b>Sheet Metal Operations:</b> Bulk deformation, shearing, rolling, Extrusion, Wire and Bar Drawing, Basic heat treatments.</p> <p><b>Need for Non-Traditional Machining:</b> Electrical, Electro-chemical, Thermal (Electric Discharge Machining, Electron Beam Machining, Laser Beam Machining, Plasma Arc Cutting), Mechanical (Abrasive Jet Machining, Ultra-sonic Machining).</p>				
<b>Recommended Books</b>				
1. Fundamentals of Modern Manufacturing, Latest Edition, Mikell P. Groover.				



Curriculum for  
**Bachelor of Automotive Engineering Technology**

**2.13 Teaching of Holy Quran Translation-I/Ethics**

<b>CODE &amp; TITLE</b> (AUH-141) Teaching of Holy Quran Translation-I/Ethics		<b>CREDIT &amp; CONTACT HOURS</b> (1+0) 16 Lectures		<b>KNOWLEDGE AREA/ DOMAIN</b> Civilization-I	
<b>After course completion students will be able to:</b>				<b>Bloom's Taxonomy (Level)</b>	<b>SA Addressed by the Course</b>
<b>CLO-1</b>	Understating the translation of the Qur'an and translate the verse			C1	SA-8
<b>CLO-2</b>	Responding and active participation on the part of learning Qur'an translation.			A2	SA-09
<b>Course Outline</b>					
This Course is designed in the way that student can learn how to spend their lives according to Quran & Sunnah and how they become perfect Muslims. This course is faith specific and has to be taught within the context of Islam and its implications in modern world. This course will groom human personality under religious belief in the context of Islam, which ultimately will result in improved individual efficiency.					
<b>Recommended Books</b>					
<ol style="list-style-type: none"> <li>1. Tabveeb ul Qur'an fee Mazameenil Qur'an by Waheed ul Zaman Khan</li> <li>2. I'sha'ria Mazameen Qur'an by Molana Syed Mumtaz Ali Introduction to mechanical engineering, 2th edition, by Guo Shaoyi, Huazhong University of Science &amp; Technology Press, 2015</li> </ol>					



Curriculum for  
**Bachelor of Automotive Engineering Technology**

**2.14 Basic Chinese language**

CODE & TITLE (AUH-152) Basic Chinese language		CREDIT & CONTACT HOURS (1+1) 16 lectures +48 Lab	KNOWLEDGE AREA/ DOMAIN Social Sciences E2	
<b>After course completion students will be able to:</b>			Bloom's Taxonomy (Level)	SA Addressed by the Course
<b>CLO-1</b>	Students will be able to memorize the characters of Chinese Language		C1	SA-10
<b>CLO-2</b>	Students will be able to use the phrases, clauses and sentences of Chinese Language for daily life		C3	SA-10
<b>Course Outline</b>				





## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.15 Professional Ethics

COURSE CODE & TITLE (AUH-213) Professional Ethics	CREDIT & CONTACT HOURS (3+0) 48 Theory + 0 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Social Science	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Comprehend</b> the basic concepts of personal and professional ethics	C-2	SA-8
<b>CLO-2</b>	<b>Respond</b> to ethical dilemmas using common ethical values	A-2	SA-8
<b>CLO-3</b>	<b>Adopt</b> ethical principles at various professional levels.	A-3	SA-8
<b>Course Outline for Theory</b>			
<p>Introduction: Introduction to ethics, personal and professional ethics, the nature of engineering ethics; legal, professional and historical definitions; origin of professional ethics, profession and professionalism; professional accountability, professional success, professional risks, professional associations; benefits of acting ethically and consequences of acting unethically. Value of Ethics: Values in professional ethics, central responsibility of engineering professionals, ethics in different fields of work, IEEE code of ethics, ethical code for engineering professionals, global issues in professional ethics, ethics in manufacturing and marketing, intellectual property rights, business ethics and corporate governance. Ethical Dilemmas: Common ethical dilemmas, resolution of ethical dilemmas, possible actions in response to dilemmas, probable consequences of these actions.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Charles E. Harris, Engineering Ethics Concepts &amp; Cases, Cengage, 5th Edition, Cengage 2014</li> <li>2. Mike W. Martin, Roland Schinzinger, Ethics in Engineering, McGraw-Hill, New York, 2005 4<sup>th</sup> Edition</li> <li>3. Stephan r. Covey, The Seven Habits of Highly effective people</li> </ol>			



# Curriculum for Bachelor of Automotive Engineering Technology

## Course Content 2.16 Basic Electrical and Electronics

COURSE CODE & TITLE (AUT-213) Basic Electrical and Electronics	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Foundation-V	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Describe</b> the construction and working of motors, transformers, rectifiers and amplifiers.	C-2	SA-1
<b>CLO-2</b>	<b>Solve</b> electric circuits by applying relevant principles.	C-3	SA-2
<b>Course Outline for Theory</b>			
<p>Basic concepts of voltage, current, resistance, capacitance, and inductance, Series and parallel circuits, series parallel combination calculations, ohm law, law of resistance, Kirchhoff's Laws, Construction and Working principles of DC Machines and their types, speed control of DC motors, working principles and applications of AC and servo motors, Construction and working principles of single and three phase transformers, Construction and application of various types of rectifiers.</p>			
<b>Sample Lab Experiment</b>			
<p>Find the Equivalent resistance of a series, parallel and series parallel combination of Resistors. Use of ohm, volt, Am-meters, resistor color coding, speed control of DC motor, turn ratio of transformer, half wave and full wave rectifiers, construction various types of amplifiers using BJT, measure gain and efficiency of an amplifier; Find the Equivalent resistance of a series, parallel and series parallel combination of Resistors</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Robert Boylestad, Introductory Circuit Analysis, Latest Edition, Pearson.</li> <li>2. Thomas L. Floyd, Electronic Devices Latest Edition, Pearson.</li> <li>3. Hughes and Drury, Electric Motors and Drives: Fundamentals, Types and Applications, Latest Edition, Pearson.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.17 Automotive Engines

COURSE CODE & TITLE (AUT-222) Automotive Engines	CREDIT & CONTACT HOURS (1+1) 16 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Foundation-VI	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the types of Engines, combustion process, ignition system, air and fuel delivery system and the functioning of the lubrication and cooling system.	C-2	SA-1
<b>CLO-2</b>	<b>Analyze</b> the importance of fuels, auxiliary systems and other design aspects on the performance of engines.	C-4	SA-4
<b>CLO-3</b>	<b>Assemble</b> and disassemble engine of a vehicle using general purpose tools and Special Service tools by following the Service Manual.	P-3	SA-5
<b>Course Outline for Theory</b>			
<p><b>Introduction to Internal Combustion Engines:</b> Classification of Internal Combustions Engines, Applications, Basic Engine Design parameters, Working Cycle, Fuel, Mixture Preparation, Ignition, Combustion Chamber Design, Method of Load Control, Engine Parts and their Basic Functions, Advantages &amp; Disadvantages.</p> <p><b>Construction and Operation of ICE:</b> Constructional Details of Spark Ignition (SI) and Compression Ignition (CI) Engines. Working Principles. Two Stroke SI and CI Engines. Comparison of SI and CI Engines and Four Stroke and Two Stroke Engines. Engine Classification, Firing Order. Otto, diesel and dual cycles.</p> <p><b>Fuel and Ignition:</b> Combustion, Combustion Chambers, Combustion Chamber Design, Combustion in SI Engines - Stages of Combustion, Factors Affecting Flame Propagation, Knock in SI Engines, Variables Affecting Knocking, Injection in SI Engines, Carburetion - Types of Carburetors, Spark Plugs, Ignition System - Battery Coil, Magneto Coil, Electronic, Mixture Preparation Method, Method of Load Control, EFI, Combustion in CI Engines.</p> <p><b>Cooling System:</b> Types of Cooling, Applications, Advantages &amp; Disadvantages, Functions of Automobile Cooling System, Parts of a Water-cooling System, Cooling System Operation, Air and Liquid Cooling Systems, Thermo Syphon and Forced Circulation and Pressurized Cooling Systems.</p> <p><b>Fuels:</b> Properties of Fuel, Fractional Distillation, Air Fuel Ratio Requirements, Conventional Fuel, Alternate Fuel, Gasoline/Petrol, Octane Number, Diesel Fuel, Octane Cetane No, Cetane Index, Typical Index, High Speed Diesel Fuel, Additives, Euro compliance.</p> <p><b>Auxiliary Systems:</b> Turbocharger, Super-Charger, Types of Super-Charging and Turbo-Charging - Relative Merits, Matching of Turbocharger.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Ganesan.V., Internal Combustion Engines, Tata-McGraw Hill.</li> <li>2. Willard W. Pulkrabek, Engineering Fundamentals of the Internal Combustion Engine, Pearson Prentice Hall.</li> <li>3. Maleev.V.M., Diesel Engine Operation and Maintenance, McGraw Hill.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

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4. William H. Crouse, Automotive Engines, McGraw Hill.



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.18 Engineering Mechanics

COURSE CODE & TITLE (AUT-233) Engineering Mechanics	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Automotive Technology Foundation-VII	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Solve</b> problems of friction, kinematics and kinetics of particles.	C-3	SA-2
<b>CLO-2</b>	<b>Analyze</b> structures such as plain trusses, frames, and machines for reaction forces.	C-4	SA-4
<b>CLO-3</b>	<b>Conduct</b> experiments related to engineering mechanics using laboratory equipment.	P-3	SA-4
<b>CLO-4</b>	<b>Appreciate</b> the practical aspects of mechanics including friction, velocity ratio and mechanical advantage.	A-2	SA-1
<b>Course Outline for Theory</b>			
<p>Force System, force, rectangular components, moment, couples, resultant of forces, equilibrium, mechanical systems, isolation, and equilibrium equations. Free body diagram, two force and three force members, plane trusses, method of joints, method of sections, frames and machine analysis, forces in beams and cables, friction, types of friction, dry friction, application of friction. Impulse and momentum, angular impulse and angular momentum, Instantaneous center of zero velocity, relative acceleration planar kinetics of rigid bodies. Force, mass, acceleration, equation of motion. Work and Energy relationship. Dynamics of particles and rigid body including kinematics and kinetics.</p>			
<b>Sample Lab Experiments</b>			
<p>Verify Hook's law, determination of static equilibrium by using coplanar concurrent forces, determination of reactions and moments in beams, tension in hanging ropes. Verification of Force Polygon Method for various Co- planer forces, relation of Coefficient of Friction of different solid materials, determination of Coefficient of Friction for various materials, Determination of Moment of Inertia of Fly Wheel. Determination of the Efficiency, velocity ratio, mechanical advantage of various systems such as screw jack worm and worm wheel, Pulleys and Tie and Jib crane. Determination of Linear and Angular speed. Determination of centrifugal force. Measurement of Angular Momentum.</p>			



## Curriculum for Bachelor of Automotive Engineering Technology

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Recommended Books
<ol style="list-style-type: none"><li>1. Meriam, J.L. And Kraige, L.G., Engineering Mechanics: Dynamics (Vol. 2). Latest Edition, John Wiley &amp; Sons.</li><li>2. R. C. Hibbeler. Engineering Mechanics (Dynamics), Latest Edition, Prentice Hall.</li><li>3. Beer, F.P., Johnston Jr, E.R. And Oler, J.W., Vector Mechanics for Engineers, Latest Edition.</li></ol>



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.19 Project Management

<b>COURSE CODE &amp; TITLE:</b>  (AUM-213)  <b>Project Management</b>	<b>CREDIT &amp; CONTACT HOURS</b> (2+0)  <b>32 Theory + 0 Lab Sessions</b>	<b>KNOWLEDGE AREA/DOMAIN</b>  <b>Management Science</b>	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Describe</b> the basic functions of management with a special focus on project management.	C-2	SA-11
<b>CLO-2</b>	<b>Apply</b> knowledge areas of project management	C-3	SA-11
<b>CLO-3</b>	<b>EmSAy</b> ICT technologies in Project Management such as MS-Project & Primavera	P-3	SA-5
<b>Course Outline</b>			
<p>Introduction to Management: History of management, functions and functional areas of management, levels of management, managerial skills, types of organizations, managerial control, principles of management. Introduction to Project Management: Definition of Project and Project Management, knowledge areas of project management, project life cycle, project characteristics, project constraints, project organization structure. Project Quality Management: History of Quality Management, defining quality, relationship between project management and quality management, Quality Management Frameworks.</p> <p>Project Stakeholder Management: The roles of project manager and project sponsor, project team selection, skills, and competencies of project manager, building and managing successful project teams, stakeholder management .Project Cost Estimating and Budgeting: Cost components and methods for cost estimation in projects, cost control in projects, life cycle cost, cost scheduling and forecasting, project resource allocation and levelling, estimation of outstanding work, elements of budgets and estimates, earned value management.</p> <p>Project Risk Management: Defining risk and uncertainty, business and project risk, probability and impact of risk, risk management process. Project Time Management: Introduction to project scheduling, Critical Path Method, network representation of projects, critical activities, and critical path, project Gantt Chart. Project Closure: Project evaluation, project and project management success, success criteria for projects, project audits, project termination process. Project Management Tools: Introduction and use of project management tools like MS Project and Primavera.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Harold Kerzner, Project Management: A System Approach to Planning Scheduling and Controlling, John Willey, 11<sup>th</sup> Edition</li> <li>2. Jack R. Meredith and Samuel J. Mantel, Jr. John, Project Management: A managerial approach, Wiley and Sons, Inc., 7<sup>th</sup> Edition</li> <li>3. John M. Nicholas and Herman Steyn, Project Management for Engineering and Technology: Principles and Practice, Elsevier Publications, 3<sup>rd</sup> Edition</li> <li>4. Paul Gardiner, Project Management: A Strategic Planning Approach, Palgrave Macmillan, 2<sup>nd</sup> Edition</li> </ol>			



# Curriculum for Bachelor of Automotive Engineering Technology

## Course Content

### 2.20 Thermo-Fluids Fundamentals

COURSE CODE & TITLE (AUT-243) Thermo-Fluids Fundamentals	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Foundation-VIII	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the fundamental laws of fluid mechanics, thermodynamics and heat transfer.	C-2	SA-1
<b>CLO-2</b>	<b>Apply</b> analytical approach to solve problems related to open and closed systems, hydraulic machinery and heat transfer equipment.	C-3	SA-2
<b>Course Outline for Theory</b>			
<p><b>Basic Concepts of Thermodynamics:</b> Energy, energy transfer, and general energy analysis. Properties of pure substances. Energy analysis of closed systems. Mass and energy analysis of control volumes. The second law of thermodynamics and entropy. Power and refrigeration cycles.</p> <p><b>Introduction and Properties of Fluids:</b> Fluid statics, Bernoulli and energy equations. Pipe and Pipe Networks. Mechanisms of Heat Transfer, Steady heat conduction, Convection, Radiation Heat Transfer and Heat Exchangers.</p>			
<b>Sample Lab Experiments</b>			
<ul style="list-style-type: none"> <li>• To investigate the first law and Second law of thermodynamic using heat Engines.</li> <li>• Study of the two, four stroke petrol and four stroke diesel engines.</li> <li>• Study of Steam Bench, Determination of Dryness Fraction of Steam using Steam Bench.</li> <li>• To draw the pressure curves of a diffuser and determine the critical ratio of a nozzle.</li> <li>• To calibrate the given pressure gauge &amp; discuss its application.</li> <li>• To demonstrate Bernoulli's law by using Bernoulli's principal demonstrator.</li> <li>• Determine the friction factor and losses for internal flow in pipes.</li> <li>• Measurement of viscosity of different fluids.</li> <li>• To conduct the experimental demonstration of Fourier's law of heat conductions and determination of the Thermal conductivity "k" in a simple bar.</li> <li>• To observe effect of cross-sectional area on heat transfer.</li> <li>• To observe the insulating effect in a metallic bar of different diameter conductor.</li> <li>• To obtain heat transfer coefficient (h) in free convection in flat surfaces.</li> <li>• To calculate the efficiency of pinned exchangers.</li> <li>• To calculate efficiency of finned exchangers.</li> <li>• To obtain and SA the temperature distribution in a shell and tube heat exchanger for counter current and parallel flow.</li> <li>• To calculate the Logarithmic mean temperature difference (LMTD) of a shell and tube exchanger.</li> </ul>			





## Curriculum for Bachelor of Automotive Engineering Technology

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Recommended Books
<ol style="list-style-type: none"><li>1. Y. A. Cengel, R. Turner and J. Cimbala, Fundamentals of Thermal-Fluid Sciences, Latest Edition, McGraw-Hill.</li><li>2. Massoud, M. Engineering Thermofluids, Thermodynamics, Fluid Mechanics, and Heat Transfer; 2007.</li></ol>



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.21 Mechanics of Materials

COURSE CODE & TITLE (AUT-253) Mechanics of Materials	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Breadth-I	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Describe</b> mechanical behavior of materials under tensile, compressive, torsional, and combined loadings, and Factor of safety.	C-2	SA-1
<b>CLO-2</b>	<b>Solve</b> problems related to structural members under stress, strain, and deflection.	C-3	SA-2
<b>CLO-3</b>	<b>Design</b> shaft parameters under torsional loading.	C-4	SA-3
<b>Course Outline for Theory</b>			
The concept of stress and strains under direct and transverse loading conditions. Stress-strain diagram, poisson's ratio, Factor of safety. Understand the Mechanical properties of Different materials under various loading conditions. Failure due to axial loading in beams, bars, columns etc. Description of strength, resilience, toughness, and fracture under tensile and compressive loadings. Concept of area moment of inertia and polar mode of inertia. Torsion, design of shaft and its failure due to torsional loads. Determination of bending stresses and deflection in different types of beams under various loading conditions.			
<b>Lab Outline</b>			
<ul style="list-style-type: none"> <li>• To perform the practical's relating to determine the behaviours of the materials under various loading conditions.</li> <li>• To Investigate the various mechanical properties like strength, toughness, stiffness.</li> <li>• To Determine of Brinell Hardness, Vicker hardness and Rockwell Hardness testing of different materials</li> <li>• To determine the effects of creep, and fatigue on different materials.</li> <li>• Determination of deflection of various types of beams under different loading conditions.</li> <li>• Determination of Impact Energy using Charpy/Izod testing.</li> <li>• To find the modulus of elasticity (E), modulus of rigidity (G).</li> <li>• To determine shear stress (<math>\tau</math>) for a given shaft specimen in torsion.</li> </ul>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Meriam, J.L. And Kraige, L.G., Engineering Mechanics: Dynamics (Vol. 2). John Wiley &amp; Sons.</li> <li>2. R. C. Hibbeler. Engineering Mechanics (Dynamics), Latest Edition., Prentice Hall.</li> <li>3. Beer, F.P., Johnston Jr, E.R. And Oler, J.W., Vector Mechanics For Engineers.</li> <li>4. Mechanics of materials – R. C. Hibbeler, Latest Edition.</li> <li>5. Mechanics of Materials – Ferdinand Beer, E. Johnston, John DeWolf and David Mazurek, Latest Edition.</li> <li>6. Mechanics of Materials – James M. Gere, Barry J. Goodno.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.22 Technical Writing and Communication Skills

COURSE CODE & TITLE (AUE-222) Technical Writing and Communication Skills	CREDIT & CONTACT HOURS (1+1) 16 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Expository Writing – II	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> basic theories of communications.	C-2	SA-10
<b>CLO-2</b>	<b>Present/ report</b> technical contents both orally and in writing.	C-2	SA-10
<b>CLO-3</b>	<b>Participate</b> in group discussion while practicing professional ethics.	A-3	SA-9
<b>Course Outline for Theory</b>			
Importance, Theories, Barriers and components of communication, The seven C's of effective communication, Listening skills, Notes taking, Giving feedback, Active reading techniques, Skimming, General and careful reading, Planning, Drafting and editing, Emphasis and connections in writing, Technical and business vocabulary, Constructing formal sentences, Communication as a Tool For Effective Interpersonal Engagement, Communication barriers and their mitigation strategies, Preparing and presenting using modern tools.			
<b>Recommended Books</b>			
1. Murphy H. A., Hildebrandt H. W. and Thomas J.P. "Effective Business Communications". McGraw Hill, USA 2. Norman S. "We're in Business" Longman Group Ltd., UK 3. Thomson A. J. and Martinet A.V. "A practical English Grammar" Oxford University Press, UK.			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.23 Linear Algebra

COURSE CODE & TITLE (AUQ-212) Linear Algebra		CREDIT & CONTACT HOURS (2+0) 32 Theory + 0 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Quantitative Reasoning-III	
<b>After completion of this course students will be able to:</b>			<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> basic definitions, properties, and theorems of linear algebra.		C-2	SA-1
<b>CLO-2</b>	<b>Solve</b> systems of linear equations using matrices.		C-3	SA-2
<b>Course Outline for Theory</b>				
<p>System of linear equations, row reduction and echelon forms, vector equations, the matrix equation <math>ax=b</math>. Solution sets of linear systems, applications of linear systems. Concept of matrices, types of matrices, operation on matrices i.e., addition, subtraction, multiplication, properties of matrix operation, the elementary row operation, echelon form, solution of linear system of equation by gauss elimination method, concept of consistent and inconsistent solution, polynomial interpolation. inverse of matrix using Gauss-Jordan method. Determinant of matrix: definition and properties of determinants and their theorem, concept of singular and nonsingular matrix, solution of non-homogenous linear system of equation using Cramer's rule. Introduction to linear transformation, daily life application i.e., cryptography example coding and decoding the messages, computer graphic.</p>				
<b>Recommended Books</b>				
<ol style="list-style-type: none"> <li>1. Bernard Kolman, Introductory Linear Algebra, Pearson, 9<sup>th</sup> Edition</li> <li>2. Erwin Kreyszig, Advanced Engineering Mathematics, Willey, 10<sup>th</sup> Edition</li> <li>3. D. C. Lay, S. R. Lay, J. J. McDonald, "Linear Algebra and Its Applications", Pearson Education 5th Edition</li> <li>4. Gilbert Strang, Linear Algebra and its Applications, Cengage, 4<sup>th</sup> Edition</li> </ol>				



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.24 Automotive Materials and Metallurgy

<b>COURSE CODE &amp; TITLE:</b> (AUT-263) <b>Automotive Materials and Metallurgy</b>	<b>CREDIT &amp; CONTACT HOURS</b> (2+1) <b>32 Theory + 48 Lab Sessions</b>	<b>KNOWLEDGE AREA/ DOMAIN</b> <b>Automotive Technology</b> <b>Breadth-II</b>	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the use of engineering materials in terms of nature, type, properties, behaviors, bonding, and crystal structure along its implications on environment and sustainability.	C-2	SA-7
<b>CLO-2</b>	<b>Interpret</b> phase-diagrams and effects of heat treatments on microstructure of ferrous materials.	C-1	SA-1
<b>CLO-3</b>	<b>Demonstrate</b> the mechanical properties of the engineering materials using available laboratory equipment.	P-3	SA-5
<b>CLO-4</b>	<b>Prepare</b> the samples of metals & non-metals to analyze their microstructure on microscopes.	P-3	SA-4
<b>Course Outline for Theory</b>			
Properties of materials, classification of materials, Structure of materials, Crystal structure of metals, alloys, equilibrium diagrams, interpretation of phase diagrams of ferrous and non-ferrous materials, practical microscopy, Introduction to iron and steel making, hot and cold working of metals, heat treatment of plain carbon steels, surface hardening of steels, non-ferrous alloys, plastics, rubbers, ceramics, glasses and composites for automotive applications, Fiber-reinforced plastics (FRP), Material testing, causes of material failure, Corrosion and their control, Grades and standards of materials, choice of materials and processes, selection of materials.			
<b>Lab Outline</b>			
<ul style="list-style-type: none"> <li>• To prepare the samples of metals &amp; non-metals to analyze their microstructure by using microscopes to understand their behavior and structural conditions.</li> <li>• To understand different composite manufacturing and characterization techniques.</li> <li>• Determine various texture &amp; coating, sputtering etc. techniques.</li> <li>• To determine the various environmental effects (moisture, corrosion, thermal effects, emission etc) on automotive materials.</li> </ul>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Materials for Automobile Bodies, Latest Edition. Geoffrey Davies.</li> <li>2. Materials Science and Engineering: An Introduction, Latest Edition. William D. Callister Jr., David G. Rethwisch.</li> <li>3. An Introduction to Materials Engineering and Science by Brian S. Mitchell.</li> <li>4. Materials for Engineers and Technicians, Latest Edition, William Bolton, R.A. Higgins, Newness.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.25 Computer Programming

COURSE CODE & TITLE (AUC-212) Computer Programming	CREDIT & CONTACT HOURS (1+1) 16 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Computer-II	
After completion of this course students will be able to:		Bloom's Taxonomy Level	SA
<b>CLO-1</b>	<b>Write</b> pseudo code and a flow chart for a given problem.	C-3	SA-1
<b>CLO-2</b>	<b>Write</b> a computer program using any high-level language.	P-3	SA-5
<b>CLO-3</b>	<b>Illustrate</b> the use of arrays, classes and other functions for an intermediate level program.	P-2	SA-5
<b>Course Outline for Theory</b>			
<p><b>Basics:</b> constants and variables, keywords, identifiers, data types, variables and their types, escape sequence, operators and statements.</p> <p><b>Decision and Control:</b> if statements, if-else-if statement, switch statement, for loop, while loop, do-while loop, nested loops, break statement.</p> <p><b>Functions:</b> defining a function, types of function, return statement, default argument, local and global variables, standard function and user defined functions, multifunction, arguments pass as reference or as a value.</p> <p><b>Arrays:</b> declaration, initialization, arrays and function, multidimensional arrays.</p> <p><b>Structures:</b> declaration, initialization, functions and structures, arrays of structure, nested structure, enumerations.</p> <p><b>Classes:</b> declaration, initialization, constructors, destructors, inline member function, static class member, friend function, defining and accessing object, arrays of class object, structure and classes, nested classes.</p> <p><b>Inheritance:</b> single inheritance, types of base classes, types of derivation, multiple inheritance containers.</p>			
<b>Lab Outline</b>			
Hands on experience to the topics covered in theory.			
<b>Recommended Books</b>			
1. Kent Lee, 2015, Python Programming Fundamentals, Latest Edition, Springer.			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.26 Automotive Electrical and Electronics

COURSE CODE & TITLE (AUT-273) Automotive Electrical & Electronics	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Automotive Technology Breadth	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Describe</b> the working principle of vehicle electrical and electronic systems with their wire harnessing.	C-1	SA-1
<b>CLO-2</b>	<b>Describe</b> the instrumentation systems of the vehicle with their communication channels.	C-2	SA-1
<b>CLO-3</b>	<b>Perform</b> the experimental work-related diagnosis using Electrical training bench, OBD scanner and multimeter.	P-3	SA-5
<b>Course Outline for Theory</b>			
Types of diagnostic tools, introduction to ECU, CAN Bus and OBD protocol, exhaust analyzer, introduction to vehicle ignition, battery, electronic braking and charging system, Gauges and warning devices, instrumentation and sensing, electronic fuel injection, power electronics, reading Service Manuals.			
<b>Lab Outline</b>			
Use of digital multimeter, OBD, CAN bus, instrumentation cluster, exhaust analyzer, and ECU tuning. Service Manuals of the vehicles, Special Service tools (SST).			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Tom Denton, 2017, Automobile Electrical and Electronic System Latest Edition, Routledge.</li> <li>2. Barry Hollembeak, 2017, Today's Technician: Automotive Electricity and Electronics, Latest Edition, Cengage.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.27 Occupational Health, Safety and Environment

<b>COURSE CODE &amp; TITLE</b> (AUM-222) <b>Occupational Health, Safety and Environment</b>	<b>CREDIT &amp; CONTACT HOURS</b> (2+0) <b>32 Theory + 0 Lab Sessions</b>	<b>KNOWLEDGE AREA/ DOMAIN</b>  <b>Management</b>	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Identify</b> societal, health & safety issues pertinent in Vehicle or Automotive Industry for meeting SDGs.	C-3	SA-6
<b>CLO-2</b>	<b>Appreciate</b> the use of PPEs at workplace.	A-3	SA-6
<b>CLO-3</b>	<b>Explain</b> the ethical and legal requirements of Industry for protecting health and environment.	C-2	SA-7
<b>Course Outline for Theory</b>			
<p><b>Introduction of Health, Safety &amp; Environment:</b> introduction &amp; objectives of safety, importance of safety in an Automotive industry, accidents, types of accidents, effects of accidents, greenhouse gases, global warming.</p> <p><b>Principles of Accident Prevention:</b> hazards and its types, risk, sources of risk, risk assessment, risk matrix, personal protection equipment (PPEs), safety management and hierarchy of control, safety training, first aid and emergency procedures, ergonomics.</p> <p><b>Fire Safety:</b> chemistry of fire, fire triangle, types of fire, fire prevention and control, fire extinguishers, pass rule for fire extinguishers.</p> <p><b>Environmental Acts:</b> legal, humanitarian and economic reason for action, Pakistan health and safety act, OHSAS 18001, environmental management system ISO 14001, ISO standards for safety and health and environment.</p> <p><b>Pollution and its Types:</b> Atmospheric Pollution &amp; types of Atmospheric pollution, Causes and Effects of Atmospheric Pollution on Human Health Available Technologies for Controlling Pollution, Industrial Waste, Solid Waste, Industrial Effluents and Waste Gases, Waste treatment plants, Noise Pollution, Measurement of Noise level, Effect of excessive noise on human health, Remedial Measures.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Safety at Work, Latest Edition by John Ridley, Butter Worths Publishers.</li> <li>2. K. G. Lockyer Factory &amp; Production Management, Pitman Publishing (1974).</li> <li>3. Holt A.S.J Principle of Health &amp; Safety at work. (2015), The Caverdisk Press Limited. UK 1999.</li> <li>4. Patty F.A "Industrial Hygiene &amp; Toxicology, Latest Edition, Vol-04 General Principles", Willy publishers.</li> <li>5. Barbara J. Peters and George A. Peters Automotive Vehicle Safety, Latest Edition, SAE International and Taylor 2002.</li> </ol>			





Curriculum for  
**Bachelor of Automotive Engineering Technology**

**2.28 Teaching of Holy Quran Translation-II/Ethics**

<b>CODE &amp; TITLE</b> (AUH-221) Teaching of Holy Quran Translation-II/Ethics		<b>CREDIT &amp; CONTACT HOURS</b> (1+0) 16 Lectures + 48 Labs		<b>KNOWLEDGE AREA/ DOMAIN</b> Civilization-I	
<b>After course completion students will be able to:</b>				<b>Bloom's Taxonomy (Level)</b>	<b>SA Addressed by the Course</b>
<b>CLO-1</b>	Understating the translation of the Qur'an and translate the verse			C1	SA-08
<b>CLO-2</b>	Responding and active participation on the part of learning Qur'an translation.			A2	SA-09
<b>Course Outline</b>					
<p>This Course is designed in the way that student can learn how to spend their lives according to Quran &amp; Sunnah and how they become perfect Muslims. This course is faith specific and has to be taught within the context of Islam and its implications in modern world. This course will groom human personality under religious belief in the context of Islam, which ultimately will result in improved individual efficiency.</p>					
<b>Recommended Books</b>					
<ol style="list-style-type: none"> <li>3. Tabveeb ul Qur'an fee Mazameenil Qur'an by Waheed ul Zaman Khan</li> <li>4. I'sha'ria Mazameen Qur'an by Molana Syed Mumtaz Ali Introduction to mechanical engineering, 2th edition, by Guo Shaoyi, Huazhong University of Science &amp; Technology Press, 2015</li> </ol>					



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.29 Automotive Chassis

COURSE CODE & TITLE (AUT-313) Automotive Chassis	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Depth-I	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Describe</b> the working of chassis systems.	C-2	SA-1
<b>CLO-2</b>	<b>Demonstrate</b> the testing and service of chassis systems.	P-3	SA-1
<b>Course Outline for Theory</b>			
<p><b>Chassis Frame:</b> Chassis systems, Types of Chassis frame, Space frame and Monocoque, Chassis Construction, C-Section, and Design aspect of chassis frame, Construction of frames.</p> <p><b>Wheels and Tires:</b> Tire types, Tyre standards, Rolling radius, Rolling resistance, Forces on Tyres, types of Wheels and their standards.</p> <p><b>Suspensions and Steering:</b> Types of suspension, Sprung and Un-sprung mass, types of dampers, Ride and Handling, Testing and Servicing of Suspension, Types of Steering system, Steering mechanism, Steering geometry, Rack and pinion steering box, Screw and sector steering box, Steering column, Power steering, Testing and servicing of Steering system.</p> <p><b>Brakes:</b> Car brakes, braking forces, braking distance, Types of brakes, Testing and Servicing of brakes.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. The Automotive Chassis: Engineering Principles, Latest Edition by J. Reimpell, H. Stoll &amp; W. Betzler, SAGE International.</li> <li>2. Automotive Engineering: Power Train, Chassis System and Vehicle Body, edited by D. A. Crola, Elsevier, Latest Edition.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content 2.30 Machines and Mechanisms

COURSE CODE & TITLE (AUT-323) Machines and Mechanisms	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab sessions	KNOWLEDGE AREA/DOMAIN Automotive Technology Breadth-III	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the concepts of mechanics for the operations of machine elements.	C-2	SA-1
<b>CLO-2</b>	<b>Calculate</b> the kinematic characteristics of mechanisms such as linkages, cams, and gears used in automobiles.	C-3	SA-2
<b>CLO-3</b>	<b>Design</b> solutions using machine components for automotive applications meeting given needs.	C-3	SA-3
<b>CLO-4</b>	<b>Demonstrate</b> the use or measurement of automotive machine mechanisms with their performance parameters.	P-3	SA-4
<b>CLO-5</b>	<b>Undertake</b> automotive technology projects related to machine elements individually or in a group.	A-2	SA-9
<b>Course Outline for Theory</b>			
<p><b>Simple Mechanism:</b> Introduction, Types and classification of Kinematic Link, Structure, Difference between Machine and Structure, Kinematic Pair, Types of Constrained Motion, Chain, Types of Chain, Types of Joints in a Chain, Inversion of Mechanism, Quadric Cycle Chain, Inversion of Quadric Cycle Chain, Single Slider Crank Chain, Inversion of Single Slider Crank Chain, Double Slider Crank Chain, Inversion of Double Slider Crank Chain</p> <p><b>Gear Trains:</b> Introduction, Types of Gear Trains, Simple Gear Train, Compound Gear Train, Reverted Gear Train, Epicyclical Gear Train, Velocity Ratio of Epicyclical Gear Train, Compound Epicyclical Gear Train, Epicyclical Gear Train with Bevel Gears, Torque in Epicyclical Gear Trains.</p> <p><b>CAMS:</b> Introduction, Classification of CAMs and Followers, Follower Motion and Construction of CAMs profiles, Specified Contours, Tangent CAM with Reciprocating Roller Follower Circular arc CAM with Flat Faced Follower.</p> <p><b>Balancing of Rotating Masses:</b> Introduction, Balancing of Rotating Masses and wheels, Balancing of a single &amp; multi rotating mass.</p>			
<b>Lab Outline</b>			
<ol style="list-style-type: none"> <li>1. To familiarize with different machine components Technology, tools and equipment.</li> <li>2. To identify different automobile engines components and their use.</li> <li>3. To find the mechanical advantage, velocity ratio and efficiency of simple gear train.</li> <li>4. To find the mechanical advantage, velocity ratio and efficiency of worm wheel.</li> <li>5. To analyze the CAM and follower motion</li> <li>6. To Investigate and measure the Moment of inertia of flywheel.</li> <li>7. To find the mechanical advantage, velocity ratio and efficiency of wheel and axle.</li> <li>8. To find the mechanical advantage, velocity ratio and efficiency of winch.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

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9. To analyze the steering system and mechanism.
10. To investigate the Universal coupling apparatus / joints and motions.

### **Recommended Books**

1. Thomas Bevan, The Theory of Machines, Prentice Hall Press.
2. John J. Uicker, Gordon R. Pennock, Joseph E. Shigley, Theory of Machines and Mechanisms, Oxford University Press.
3. Robert Ferrier McKay, The Theory of Machines, Palala Press.
4. J. A. Collins, Mechanical Design of Machine Elements and Machines, Pearson Press.
5. R. L. Norton, Design of Machinery, McGraw-Hill Education.



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.31 Engine Emissions and Control

COURSE CODE & TITLE (AUT-333) Engine Emissions and Control	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab sessions	KNOWLEDGE AREA/DOMAIN Automotive Technology Breadth	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Understand</b> the sources of engine emissions and their mitigation through different technologies.	C-2	SA-1
<b>CLO-2</b>	<b>Show</b> the impact of engine emission on environment sustainability.	C-3	SA-7
<b>CLO-3</b>	<b>Measure</b> engine emission using laboratory equipment.	P-4	SA-5
<b>CLO-4</b>	<b>Appreciate</b> the commitment and compliance of relevant international standards for engine emissions and control.	A-2	SA-6
<b>Course Outline for Theory</b>			
<p><b>Introduction:</b> Pollutant emissions, GHG Emissions and Fuel Technology, Power Train Efficiency, Vehicle Technology and Operational Parameters.</p> <p><b>Emission Control Technologies:</b> Engine Design Technologies for Emission Reduction, Fuel Injection, Exhaust Gas Recirculation, Intake Boosting, Intake Temperature Management, Combustion Chamber Design, Variable Valve Actuation</p> <p><b>Fuel And Lubricant Technologies:</b> Lubricating Oils, Alternative Fuels, Oil Additives.</p> <p><b>Exhaust After Treatment Technologies:</b> Oxidation Catalysts, Three-way Catalyst, NOx Adsorber Catalysts, Gasoline Particulate Filters.</p> <p><b>Control, Diagnostics and Powertrain Technologies:</b> Hybridization, On Board Diagnostic Systems, Controls.</p>			
<b>Lab Outline</b>			
Conduct basic experiments to measure emissions for different fuels. Conduct basic experiments to measure emissions for different fuels. Determine environmental impact of emissions by automotives.			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. W. W. Pulkrabek, Engineering Fundamentals of The Internal Combustion Engines, Latest Edition, Pearson Education, 2003.</li> <li>2. J B Heywood, Internal Combustion Engine Fundamentals, Latest Edition, McGraw Hill, 2018.</li> <li>3. R Stone, Introduction to Internal Combustion Engines, Latest Edition, Palgrave MacMillan, 2014.</li> </ol>			



# Curriculum for Bachelor of Automotive Engineering Technology

## Course Content 2.32 Automotive HVAC Technologies

COURSE CODE & TITLE (AUT-343) Automotive HVAC Technologies	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Depth	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Understand</b> HVAC systems of vehicles.	C-2	SA-1
<b>CLO-2</b>	<b>Solve</b> problems related to the processes through heating and cooling load calculations of vehicles for HVAC system selection.	C-3	SA-2
<b>CLO-3</b>	<b>Demonstrate</b> sustainable solution for automotive HVAC systems.	C-3	SA-7
<b>CLO-4</b>	<b>Conduct</b> basic experiments of refrigeration and air conditioning using laboratory equipment.	P-3	SA-5
<b>Course Outline for Theory</b>			
<p><b>Fundamentals of Refrigeration Cycles:</b> Vapour Compression cycle, Vapour Absorption cycle, Types of Refrigerants, Refrigeration components and controls, Psychrometry, Air Conditioning Systems; Air Conditioning Equipment, components and controls, Duct Systems, Fans and Air Distribution Systems, Indoor Air Quality, Heating and Cooling Load Calculations, Energy efficient buildings, Automotive air conditioning system.</p> <p><b>Maintenance and Repair of Domestic and Commercial Equipment:</b> Maintenance of a new installation-sample scheduling, Types of air compressors, Compressor efficiency and operation, Capacity assessment, Leakage test, Factors affecting the performance and efficiency, compressor repair and checking the efficiency, Pneumatics, pneumatic control, descaling of condenser, purging or removing air from system; Refrigeration and Air conditioning Tools: List of tools and their applications, safety precautions.</p> <p><b>Fans and Blowers:</b> Types, Performance evaluation, Efficient system operation, Flow control strategies and energy conservation opportunities.</p>			
<b>Sample Lab Experiments</b>			
<p>Find the C.O.P. of refrigerator. Effect of condensing temperature on the performance of refrigerator. Calculate the efficiency of a refrigerator. Construction of pressure enthalpy diagram for a vapor compression System refrigeration and its performance measurement. To check the performance of a vapor compression system refrigerator by Varying the heat input to the evaporator. Representation of Properties of air on Psychrometric charts. Air conditioning cycle on charts. Demonstration of domestic refrigerator. Demonstration of cooling tower. Demonstration of window type air conditioner. Demonstration of chiller AC plant. Study of different Phase Change materials.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. William C. Whitman , (2008), Refrigeration and Air Conditioning Technology , Latest Edition, Cengage Learning.</li> <li>2. Miller and Miller, (2011), Air Conditioning and Refrigeration, Latest Edition, McGraw Hill.</li> <li>3. Dick Wirz, (2017), Commercial Refrigeration for Air Conditioning Technicians, Latest Edition, Cengage Learning.</li> <li>4. Edward G. Pita, (1989), Air Conditioning Principals and Systems, Latest Edition, Wiley &amp; Sons.</li> </ol>			



Curriculum for  
**Bachelor of Automotive Engineering Technology**

**Course Content**

**2.33 Total Quality Management**

COURSE CODE & TITLE (AUM-312) Total Quality Management		CREDIT & CONTACT HOURS (2+0) 32 Theory + 00 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Automotive Technology Depth	
After completion of this course students will be able to:			Bloom's Taxonomy Level	SA
CLO-1	Apply lean methodologies for the benefits of local industry.		C-3	SA-6
CLO-2	Use statistical software for quality control tools.		C-3	SA-5
<b>Course Outline for Theory</b>				
<p><b>Introduction to Quality:</b> Definition and dimensions of quality, Quality control and Assurance, Cost of quality and its related indices, Vision, Mission and Quality Policy, Customer satisfaction and feedback system.</p> <p><b>Statistical Process Control:</b> Controls charts for mean standard deviation and proportion defective, process capability indices, Acceptance sampling, single and multiple sampling, introduction to six-sigma, DMAIC.</p> <p><b>Japanese Production System:</b> Principles and operating strategies, Takt-time, Quality circle, Kanban 5S, Pokayoka, Cost concept, 3M (Mura, Muri, Muda).</p> <p><b>TQM:</b> Pareto, Flow chart, Cause and Effect diagram, Failure Mode &amp; Effect Analysis (FMEA), Improvement Strategies, Lean concepts and waste reduction methods, PDCA Cycle, KAIZEN, Quality Function DeSeyment (QFD), Introduction to Quality Management System (ISO).</p>				
<b>Recommended Books</b>				
<ol style="list-style-type: none"> <li>1. Total Quality Management: International Edition, 3/E, Dale H Besterfield, Pearson, 2015</li> <li>2. Fundamentals of Quality Control and Improvement, Amitava Mitra, 4<sup>th</sup> ed WILEY, 2016.</li> <li>3. Introduction to Statistical Quality Control, Douglas C Montgomery, 6<sup>th</sup> ed WILEY, 2009.</li> </ol>				



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.34 Hybrid and Electric Vehicles

COURSE CODE & TITLE (AUT-363) Hybrid and Electric Vehicles	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab sessions	KNOWLEDGE AREA/DOMAIN Automotive Technology Depth	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Describe</b> different architectures and configurations for EVs and HEVs.	C-2	SA-1
<b>CLO-2</b>	<b>Select</b> appropriate technologies of traction, transmission, storage and control for EVs and HEVs.	C-3	SA-2
<b>CLO-3</b>	<b>Conduct</b> basic experiments of Electric Vehicle using laboratory equipment.	P-3	SA-5
<b>Course Outline for Theory</b>			
<p><b>Introduction:</b> Configurations of EVs, Architecture of Hybrid Electric Vehicle Drive Trains, Power Flow in HEVs, Advantages and disadvantages of using series hybrid powertrain, Economic and Environmental Impact of EVs &amp; HEVs.</p> <p><b>Components of HEV powertrain:</b> Motor / Generator &amp; power converters, Turbocharged diesel engine, Battery &amp; DC/DC converter, Regenerative Braking, Driver, Supervisory Control, Integration of the components.</p> <p><b>Traction Motors:</b> Types of traction motors for EVs / HEVs, Induction Motor Construction and Classification, Induction Motor Drives, Control and Applications in EVs/HEVs, Permanent Magnet synchronous Motor/Generator Configuration and Optimization, Permanent Magnet Motor, Switch Reluctance Motors, Speed Control, Power Loss Model, Driver Model.</p> <p><b>Converters for EVs / HEVs:</b> AC-DC rectifier, DC-AC Inverter for EV and HEV, Applications, Buck (Step-down) converter, Boost (Step-up) Converter, Buck-Boost Converter.</p> <p><b>Energy storage:</b> Energy Storage Systems, Types of Batteries and performance parameters, Battery Systems, Introduction to BMS, Charging and Discharging rate calculations.</p>			
<b>Sample Lab Experiments</b>			
<ol style="list-style-type: none"> <li>1. Battery performance measurements.</li> <li>2. Motor performance measurement.</li> <li>3. BMS trouble shooting</li> <li>4. Controller Harnessing.</li> </ol>			
<b>Recommended Books</b>			





## Curriculum for Bachelor of Automotive Engineering Technology

1. J. M. Miller, Propulsion Systems for Hybrid Vehicles. Michael Faraday House, Six Hills Way, Stevenage Herts, SG1 2AY, United Kingdom: The Institution of Engineering and Technology, December 2003.
2. I. Husain, Electric and Hybrid Vehicles: Design Fundamentals. University of Akron, Ohio, USA: CRC Press, 2003.
3. M. Eshani, Y. Gao, S. E. Gay, and A. Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design. CRC Press, 2004.
4. J. Larminie and j. Lovry, Electric Vehicle Technology Explained. West Sussex: John Wiley Sons Ltd, 2003.
5. H. B. Pacejka, Tyre and Vehicle Dynamics. Oxford: Butterworth Heinemann, 2002.



Curriculum for  
**Bachelor of Automotive Engineering Technology**

**Course Content**

**2.35 Computer Aided Drafting and Modeling**

<b>COURSE CODE &amp; TITLE</b> (AUT-382) <b>Computer Aided Drafting and Modeling</b>		<b>CREDIT &amp; CONTACT HOURS</b> (0+2) <b>0 Theory + 96 Lab Sessions</b>		<b>KNOWLEDGE AREA/ DOMAIN</b> <b>Automotive Technology</b> <b>Breadth-IV</b>	
<b>After completion of this course students will be able to:</b>				<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Draw</b> general 2D and 3D objects using CAD software.			P-3	SA-5
<b>CLO-2</b>	<b>Perform</b> modeling of automotive components using CAD software with modern features like parametric modeling, animation and rendering.			C-3	SA-5
<b>Course Outline for Theory</b>					
<p>An overview of CAD, installing and configuring CAD. The drawing environment, Controlling and accelerating the drawing process, creating simple drawings, creating complex entities. Editing and SATting drawings: Editing drawing entities, changing the drawing display, printing and SATting the drawings, measuring different variables, designing shapes and text fonts. Create various 2D drawings such as bolts and nuts, Plummer block bearing, non-return valve, safety valve. Create isometric dimensional drawing of a connecting rod using isometric. Draw quarter sectional isometric view of a cotter joint etc. Draw 3D models by extruding simple 2D objects, dimensioning and naming of objects. Draw 3D assembly of flange coupling, universal coupling, assembly of knuckle joint, 3D assembly gib and cotter joint, assembly drawing of connecting rod.</p>					
<b>Recommended Books</b>					
<ol style="list-style-type: none"> <li>1. French, Thomas E.; Vierck, Charles J. Engineering Drawing and Graphic Technology, Latest Edition.</li> <li>2. T. Jeyapoovan, Engineering Drawing and Graphics Using AutoCAD, Latest Edition, Vikas Publishing.</li> <li>3. N.D Bhatt, Engineering Drawing, Latest Edition, Charotar Publishing House Pvt. Ltd.</li> </ol>					



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.36 Automotive Transmission and Transaxle

COURSE CODE & TITLE (AUT-373) Automotive Transmission and Transaxle	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Automotive Technology Depth-II	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the components, working principle and performance of Transmission/Transaxle.	C-2	SA-1
<b>CLO-2</b>	<b>Perform</b> basic calculation related to gears and gear ratios.	C-3	SA-2
<b>CLO-3</b>	<b>Demonstrate</b> the basic service, maintenance and diagnostics of transmission/transaxle	P-4	SA-1
<b>CLO-4</b>	<b>Conduct</b> basic experiments of Automotive Transmission and Transaxle using laboratory equipment.	P-3	SA-5
<b>Course Outline for Theory</b>			
<p>Understand the fundamentals, principle of operation and performance of various clutches and gear boxes. Gain knowledge about various hydrodynamic drives. Conceive various types of gear boxes used for Automotive transmission. Understand the principle of operation and performance of various hydrostatic drives. Understand the principle of operation and performance of various electric drives. Introduction, Gear Box Clutch, Hydrostatic drive, Hydro dynamic drive, Electric Drive.</p>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Singh Kirpal, Automobile Engineering Vol-1, Standard Publishers distributor's.</li> <li>2. Newton and Steeds, Motor vehicles, Illiffe Publishers.</li> <li>3. Judge. A.W., Modern Transmission systems, Chapman and Hall Ltd.</li> <li>4. Crouse. W.H., Anglin, D.L., Automotive Transmission and Power Trains construction, McGraw-Hill.</li> <li>5. Jack Erjavec, Rob Thompson, Automotive Technology A Systems Approach.</li> <li>6. Vangleder, Fundamentals of Automotive Technology.</li> </ol>			



## Curriculum for Bachelor of Automotive Engineering Technology

### Course Content

#### 2.37 Fluid Power Technology

COURSE CODE & TITLE (AUT-393) Fluid Power Technology	CREDIT & CONTACT HOURS (2+1) 32 Theory + 48 Lab Sessions	KNOWLEDGE AREA/ DOMAIN Automotive Technology Depth	
<b>After completion of this course students will be able to:</b>		<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Explain</b> the fundamental principles of fluid flow used in pneumatics and hydraulics.	C-2	SA-1
<b>CLO-2</b>	<b>Interpret</b> PI&D diagrams and control circuits with proper symbols.	C-3	SA-1
<b>CLO-3</b>	<b>Demonstrate</b> the simple repair and maintenance of pneumatic and hydraulic components or systems in vehicles.	P-4	SA-1
<b>CLO-4</b>	<b>Demonstrate</b> the use of components in operation, measurement and control of hydraulic and pneumatic technology.	P-3	SA-5
<b>Course Outline for Theory</b>			
<p>The basic hydraulic theories are applied in practice, importance of good hydraulic filtration techniques, operation of pressure, flow and directional control valves and the applications in hydraulic circuits, hydraulic pumps and motors, hydraulic cylinder construction and sealing practices, basics of fluid power connectors and hose assemblies, good practice techniques and the different threads found in hydraulics, the basics of hydraulic circuit and P&amp;ID diagrams applications, the different types of hydraulic control systems and the effect on energy usage maintenance and troubleshooting techniques, the characteristics, generation and preparation of air, identification of schematic symbols used in pneumatics, design of basic pneumatic schematic drawing from a given requirement, identification of various components and their operation used in pneumatics, use pneumatic components in circuits, the maintenance requirements of each component, safe work practices for hydraulics and pneumatics.</p>			
<b>Lab Outlines</b>			
<ul style="list-style-type: none"> <li>• To understand basic health and safety guidelines.</li> <li>• To understand working principle of pumps and compressors.</li> <li>• To familiarize with types of valves, electromechanical valves, regulators.</li> <li>• To practice reading and design of pneumatic and hydraulic circuit schematics.</li> <li>• Implementation of basic pneumatic and hydraulic circuits.</li> </ul>			
<b>Recommended Books</b>			
<ol style="list-style-type: none"> <li>1. Andrew Parr ,2013, Hydraulic and Pneumatics: A Technician and Engineer's Guide, Latest Edition, Elsevier.</li> <li>2. Ian Turner, 2020, Engineering Application of Pneumatics and Hydraulics, Latest Edition, Taylor and Francis.</li> </ol>			



Curriculum for  
**Bachelor of Automotive Engineering Technology**

**Course Content**

**2.38**

**Entrepreneurship**

COURSE CODE & TITLE (AUM-323) Entrepreneurship		CREDIT & CONTACT HOURS (3+0) 48 Theory + 0 Lab Sessions	KNOWLEDGE AREA/ DOMAIN  Management	
<b>After completion of this course students will be able to:</b>			<b>Bloom's Taxonomy Level</b>	<b>SA</b>
<b>CLO-1</b>	<b>Develop</b> new Entrepreneurial ideas.		C3	SA-3
<b>CLO-2</b>	<b>Test</b> and experiment in the markets and ability to use design thinking.		C4	SA-3
<b>CLO-3</b>	<b>Evaluate</b> business models, revenues, and marketing strategies.		C5	SA-4
<b>Course Outline for Theory</b>				
A global social movement, practicing entrepreneurship, developing an entrepreneurial mindset, Generating New Ideas, Using Design Thinking, Testing and Experimenting in Markets, Building Business Models, Creating Revenue Models, Bootstrapping for Resources, Financial Statements and Projections for Startups.				
<b>Recommended Books</b>				
1. Neck, Neck, and Murray, 2018, Entrepreneurship: the practice and mindset, Latest Edition, Sage Publishers.				



Curriculum for  
**Bachelor of Automotive Engineering Technology**

**2.39 Teaching of Holy Quran Translation-III/Ethics**

<b>CODE &amp; TITLE</b> (AUH-311) Teaching of Holy Quran Translation-II/Ethics		<b>CREDIT &amp; CONTACT HOURS</b> (1+0) 16 Lectures		<b>KNOWLEDGE AREA/ DOMAIN</b> Civilization-I	
<b>After course completion students will be able to:</b>				<b>Bloom's Taxonomy (Level)</b>	<b>SA Addressed by the Course</b>
<b>CLO-1</b>	Understating the translation of the Qur'an and translate the verse			C1	SA-08
<b>CLO-2</b>	Responding and active participation on the part of learning Qur'an translation.			A2	SA-09
<b>Course Outline</b>					
This Course is designed in the way that student can learn how to spend their lives according to Quran & Sunnah and how they become perfect Muslims. This course is faith specific and has to be taught within the context of Islam and its implications in modern world. This course will groom human personality under religious belief in the context of Islam, which ultimately will result in improved individual efficiency.					
<b>Recommended Books</b>					
5. Tabveeb ul Qur'an fee Mazameenil Qur'an by Waheed ul Zaman Khan 6. I'sha'ria Mazameen Qur'an by Molana Syed Mumtaz Ali Introduction to mechanical engineering, 2th edition, by Guo Shaoyi, Huazhong University of Science & Technology Press, 2015					