



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Name of Program: Bachelor of Technology in Robotics and Automation

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC104	EC	Digital Logic & Circuit Design	60	20	20	30	20	3	1	2	5

Legends: Th - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

Q/A - Quiz/Assignment/Attendance, MST Mid Semester Test.

*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives:-

The objective of this course is to-

1. Use of Boolean algebra and Karnaugh Map to simplify logic function.
2. Describe the operation of different Combinational and Sequential Logic Circuits.

Course Outcomes:-

After completion of this course the students will be able to-

1. Design an optimal digital logic circuit to meet the given specifications.
2. Evaluate the performance of the given digital logic circuit based on specific criteria for reliable system implementation.

UNIT I

Number System & Codes: Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1's Complement & 2's Complement representation and their arithmetic operation, Floating point representation, binary codes, BCD, ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II

Boolean algebra and Logic gates: Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan's theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / Quine McCluskey method.

UNIT III

Combinational logic: Arithmetic circuits- Half adder, Full adder, Half subtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

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UNIT IV

Sequential logic: Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V

Semiconductor Memories and A/D and D/A converters: Semiconductor Memory – RAM, ROM- Organization, operation and their Types, PLD- PAL, PLA, PROM, FPGA, Analog to Digital (A/D) and Digital to Analog (D/A) converters and their types.

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. S Salivahanan and S Arivazhagan: Digital Circuits and Design, 4th Edition, Vikas Publishing House, 2012.

Reference Books:

1. A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI, 2016.
2. Floyd and Jain, "Digital Fundamentals", 10th Edition, Pearson Education India, 2011.
3. Roland J. Tocci, Widmer, Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson 2009.
4. Stephen Brown, Zvanko Vranesic, "Fundamentals of Digital Logic Design", 3rd Edition, McGraw Hill, 2017.

List of experiments:

1. To study and test of operation of all logic gates for various IC's (IC7400, IC7403, IC408, IC74332, IC7486).
2. Verification of DeMorgan's theorem.
3. To construct of half adder and full adder.
4. To construct of half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Design a BCD to excess 3code converter.
8. Design a Multiplexer/ Demultiplexer
9. Analysis of various flip flops with Preset and Clear capability.
10. Design of Johnson and Ring counter.
11. Design of synchronous and asynchronous up/down counters.

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BTMA201		Applied Mathematics -II	60	20	20	0	0	3	1	0	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

To introduce the students with the Fundamentals of the Calculus of Matrices, Differential Equations and Numerical Analysis

Course Outcomes(COs):

After the successful completion of this course, students will be able to

1. Understand and apply the basics of the calculus of matrices.
2. Solve the fundamental problems of the ordinary differential equations.
3. Apply the advanced techniques to find the solution of the ordinary differential equations.
4. Find the numerical solution of the ODE and PDE.
5. Know the techniques of the Laplace transform.

Syllabus:

UNIT I

Calculus of Matrices: Systems of linear equations and their solutions. Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices. Bilinear and quadratic forms.

UNIT II

Complex Analysis: Complex numbers, geometric representation, powers and roots of complex numbers. Functions of a complex variable: Limit, Continuity, Differentiability, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Harmonic conjugates. Elementary Analytic functions (polynomials, exponential function, trigonometric functions), Complex integration, Cauchy's integral theorem, Cauchy's integral formula. Taylor series and Laurent series. Zeros, Singularities and its classifications, Residues, Residue theorem and its applications

UNIT III

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Differential Equation: Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

UNIT IV

Partial Differential Equations: Introduction to PDEs, basic concepts, Linear and non-linear first order PDE, Higher order linear homogeneous PDE, Separation of variable and its application to the one dimensional wave and heat equation.

UNIT V

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Inverse Laplace transform and its properties, Convolution theorem, Applications of Laplace Transform to solve the Ordinary Differential Equation, Laplace transform of Unit step function and Impulse function.

Text Books:

1. G. Strang, Linear Algebra And Its Applications, 4th Edition, Brooks/Cole, 2006
2. S. L. Ross, Differential Equations, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 7th Edition, Wiley, 2001.
5. K. E. Atkinson, Numerical Analysis, John Wiley, Low Price Edition (2004).
6. S. D. Conte and C. de Boor, Elementary Numerical Analysis □ An Algorithmic Approach, McGraw□Hill, 2005.
7. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

References:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley, 2005.
2. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.
3. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
4. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.
5. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw□Hill, 2001.
6. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
7. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGrawHill 2008.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCE103		Applied Mechanics	60	20	20	30	20	2	1	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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Course Educational Objectives (CEOs):

The Students will be able to familiarize with different branches of mechanics , with emphasis on their analysis and application to practical engineering problems,efficiently & effectively.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

The students will be able to

1. To apply knowledge of mathematics, science in engineering.
2. To identify, formulate, and solve engineering problems
3. Demonstrate various types of forces and their analysis.
4. Demonstrate shear force and bending moment on structural member i.e. beams
5. Demonstrate centre of gravity and moment of inertia determination of different geometrical shaped figures.

Syllabus

UNIT I

Static Forces: Introduction to Engineering Mechanics, Classification of Engineering Mechanics, Statistics, Dynamics, Kinematics, Kinetics etc. Fundamental Laws of Mechanics.

Force, Pressure and Stress, Free Body Diagram , Bow's Notation, Characteristics and Effects of a Force, System of Forces, Resolution of a Force, Composition of Forces, Resultant / Equilibrant Force, Law of Parallelogram of Forces, Law of Triangle of Forces, Polygon Law of Forces, Lami's Theorem, Equilibrium of a Body Under Two / Three/More Than Three Forces. Law of Superposition of Forces.

Coplanar Concurrent Forces, Coplanar Non Concurrent Forces, Moment of a Force, Principle of Moments/ Varignon's Theorem, Parallel Forces, Resultant of Parallel Forces, Couple, Moment of a Couple, Resolution of Force into a Couple.

UNIT II

Analysis of Framed Structure: Frame, Types of frame, Truss, Types of truss, Analysis of Truss, Various methods of Analyzing the truss, Numericals analysis of truss


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UNIT III

CG and MI: Centroid, Centre of Gravity, Determination of Centroid of Simple Figures, Centroid of Composite Sections. Centre of Gravity of Solid Bodies. Area Moment of Inertia: Basic Concept of Inertia, Definition of Moment of Inertia, Theorems of Moment of Inertia, Radius of Gyration, Polar Moment of Inertia of Standard Sections, Moment of Inertia of Composite Section, Principal Moment of Inertia, Mass Moment of Inertia.

UNIT IV

Beams: Types of Beams: Simply Supported Beam, Overhanging Beam, Cantilever Beam. Types of Supports of a Beam or Frame: Roller, Hinged and Fixed Supports. Load on the Beam or Frame: Different Types of Loading. Support Reaction of a Beam, Shear force, Bending Moment, Pure bending.

UNIT V

Introduction to Dynamics: Overview of Dynamics, Basic Concepts and Terms Used in Dynamics, Motion, Types of Motion, Newton's Laws of Motion, Newton's Law of Gravitation.

References:

1. Prasad I.B., Applied Mechanics, Khanna Publication.
2. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI
3. S.P.Timoshenko, Mechanics of structure, East West press Pvt.Ltd.
4. R.C. Hibbler – Engineering Mechanics: Statics & Dynamics.
5. A. Boresi & Schmidt- Engineering Mechines- statics dynamics, Thomson' Books
6. R.K. Rajput, Engineering Mechanics S.Chand & Co

List of experiments:

1. To verify the law of Triangle of forces and Lami's theorem.
2. To verify the law of parallelogram of forces.
3. To verify law of polygon of forces
4. To find the support reactions of a given truss and verify analytically.
5. To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.
6. To determine the moment of inertia of fly wheel by falling weight method.
7. To verify bending moment at a given section of a simply supported beam.
8. Study of Various Beams and their Loading conditions
9. Study of Newton's laws of motion
10. Study of Newton's law of Gravitation

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BTEC101		Introduction to Communica- tion Engineering	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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Course Educational Objectives (CEOs):

The student will be able to understand the basics of various communication systems.

Course Outcomes (COs):

After successfully completing the course students will be able to

1. Understand the communication systems and channels.
2. Understand the concept of modulation and demodulation
3. Learn the basic concepts of voice communication, optical fiber and satellite communication.

Syllabus

UNIT I

Communication Process, Communication System and its elements, Types of Communication media/channels and its characteristics, Types of Electronic Communication one-way, two-way, half duplex and full duplex, Electromagnetic Spectrum and its Bandwidth.

Definition of Signals & Systems, Information, Time and Frequency Representation of Signals, types of signals, Spectrum & bandwidth of signals, Fourier analysis of signals

UNIT II

Definition of Modulation and Demodulation, need of modulation, representation of various Modulation scheme (Analog and Digital), Multiplexing & its types: TDM, FDM, CDM.

UNIT III

Voice communication, Frequency range, Introduction to telephone instruments & signals, Basic telephone operation, Public switched telephone network (PSTN), Mobile technology evolution, GSM & CDMA systems.

UNIT IV

Optical fiber transmission and communication, History of optics, block diagram of Optical fiber communication system, principle of operation, types of optical fibers


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UNIT V

Basics of Radio waves, layers of atmosphere. Satellite communication, History of Satellites, Kepler's laws, Satellite orbits and geostationary satellites.

Text Books:

1. Wayne Tomasi: Advanced Electronic Communication Systems, Sixth Edition, PHI.
2. Robert L. Shrader: Electronic Communication, Macmillan/McGraw-Hill.
3. B.P. Lathi : Modern Analog and Digital Communication System, Wiley Eastern Limited.
4. Taub and Schilling: Principles of communication Systems, TMH.

References:

1. S Haykin: Communication Systems, John Wiley and Sons Inc.
2. S Ghose: Signals and Systems, Pearson Education.
3. Steven: Communication Systems – Analysis and Design, Pearson Education.
4. Hwei P. Hsu: Schaum's Outline of Signals and Systems, McGraw-Hill.
5. Singh and Sapre: Communication Systems, TMH.
6. Reger J. Bates & D.W. Gregory, Voice & Data Communication Handbook, Fifth Edition, TMH.

List of Experiments:

1. Study of Function Generator.
2. Study of various signals on CRO and measurement of time period and frequency.
3. Synthesis of signal using Fourier series.
4. Introduction to MATLAB/ qtOctave.
5. Generation of basic signals using MATLAB/ qtOctave.
6. Mathematical analysis of basic signal operations.
7. Analyze AM signal using MATLAB/ qtOctave.
8. Analyze time division multiplexed signals.
9. Study of optical fiber communication system.
10. Study and analysis of serial communication.

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BTME102		Fundamentals of Mechanical Engineering	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; **Teacher Assessment** shall be based following components: Quiz/Assignment/Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

To introduction with Engineering Materials, thermodynamics, heat engines, refrigeration air conditioning, Production.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Student would be able to understand the need of engineering materials, and its property, need and defects.
2. Student would be able to analyses basics of thermodynamics and able to understand various mechanical instruments.
3. Students would be able to understand I C engines, their working and operating conditions.
4. Students will be able to understand the basics of refrigeration & air conditioning.
5. Student would be able to recognize production methodology and their need.
6. Students would be able to demonstrate various case studies based on heat engines, basics of thermodynamics, productions, etc.

Syllabus

UNIT I

Introduction to Engineering Materials: Introduction, classification materials, need of engineering materials, important properties of materials. Atomic structure, crystal geometry & structure, crystal imperfection, deformation of materials, phase transformation and mechanical properties.

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UNIT II

Introduction to Thermodynamics: Definition of thermodynamics, thermodynamic systems, Macroscopic and Microscopic views, thermodynamic equilibrium, properties of system, point & path function, Temperature & pressure terminology and its measurement, laws of thermodynamics.

UNIT III

Introduction to Heat Engines: Introduction, need of heat engines, types of heat engines.

IC Engines: Introduction, terminology of IC engine, cycles used in IC engine, two and four stroke engines, latest technologies used in engines of vehicle.

Boilers: Introduction, steam, types of steam, properties of steam, boilers, types of boilers, terminology related to steam and boilers, boiler mountings & accessories.

UNIT IV

Introduction to Refrigeration & Air Conditioning: Introduction, need of refrigeration, fundamentals of refrigeration, refrigeration systems, refrigerants.

Introduction, need of air conditioning, air conditioning systems, equipment's, components and control.

UNIT V

Introduction to Manufacturing: Material properties, Definition and classification of basic manufacturing process, introduction to casting, Rolling, Extrusion, welding, Brazing, Soldering.

References:

1. Mechanical Engineering by R. K. Rajput
2. Basic Mechanical Engineering by D. K. Gupta
3. Basic Mechanical Engineering (MP) by Domkundwar
4. Mechanical Engineering Handbook (CRC Press)
5. Mechanical Engineering Reference Book by E.H. Smith
6. An Introduction to Mechanical Engineering by Wickert/Lewis
7. Engineering Fundamentals: An Introduction to Engineering by Moaveni

List of Experiments

1. To perform tensile test, plot the stress-strain diagram and evaluate the tensile properties of a given metallic specimen.
2. To calculate Mechanical Advantage, Velocity Ratio and Efficiency of various temperature and pressure measuring devices and plot graphs.
3. To study Four-Stroke Diesel Engines.
4. To study Four-Stroke Petrol Engines.
5. To study the fire tube boiler, water tube boiler.
6. To study the working and function of mountings and accessories in boilers.
7. To study the Refrigeration System.
8. To study the functioning of Window Room Air Conditioner.

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BTEC103		Electronics Workshop	0	0	0	30	20	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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Course Educational Objectives (CEOs):

This course will help the student to use and test different types of electronics components, different basic electrical and Electronics instruments used in electrical & electronics circuits and systems.

Course Outcomes (COs):

1. To gain the Knowledge of Various electronics component.
2. Students will understand how to measures / characterize components through measuring instruments.
3. Students will test various electrical and electronics components, and measure circuit parameters.
4. Students will: Learn how to develop and employ circuit models for elementary electronic components

Syllabus

UNIT I

Cables and Switches: Differentiate various Cables, Connectors, Differentiate the various Switches& their usage. Connect and use cables, connectors and switches.

Protective devices: Electrical Protective devices –fuses, relay and MCB

UNIT II

Electrical and Electronics Components: Resistors, capacitors, inductors and transformers. Integrated circuits and it Packaging Technique. Soldering technique, tools and PCB

UNIT III

Measuring Instruments: Overview of Voltmeter, Ammeter, Multimeter, CRO.

UNIT IV

Electrical Drawing: Wiring diagram and control circuit: point D. C. motor starter, point D.C. motor starter, DOL starter, Star delta starter, Auto Transformer Starter, Rotor resistance starter, Control of lamp from positions.

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UNIT V

Different types of Diodes: P-N Junction diode, Zener diode, Schottky Diode,

List of experiments.

1. Identify different types of cables & test it.
2. Identify different types of connectors & Discover their application.
3. Identify different types of Switches and discover its usage.
4. Identify different types of fuses & test it.
5. Identify different types of Relays and discover its usage.
6. Identify, find value using colour code chart and test different types of Resistors.
7. Identify, find value and test different types of capacitors.
8. Identify, find value and test different types of Inductors.
9. Connect Resistor, capacitor, inductor in series and parallel circuits
10. Draw front panel control of analog and digital multimeter label it.
11. Demonstrate external controls of CRO & function Generator.
12. Measure amplitude & frequencies of different sine waveform using CRO & Function Generator.
13. Test resistor, capacitor, inductor, P-N junction Diode using CRO & Multimeter.
14. Identify Various IC packages.
15. Identify various SMD components.


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BTME103		Workshop Practices	0	0	0	30	20	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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Course Educational Objectives (CEOs):

1. To paraphrases with workshop technology, industrial safety, and understand material properties.
2. To paraphrases with carpentry shop, fitting shop, welding and sheet metal shops.

Course Outcomes (COs):

1. Student would be able to understand the need of workshop, technology related to it, and industrial safety and precautions.
2. Student would be able to use carpentry tools, analyse various wood joints and their properties.
3. Students would be able to use fitting tools to make various shapes and design.
4. Student would be able to recognize various welding techniques and their needs.
5. Students would be able to design various shapes by using sheet metals and tools related to it.

Syllabus:

UNIT I

Introduction To Workshop Technology & Industrial Safety

Workshop Technology- Introduction, need of workshop and types of workshop

Industrial Safety- Introduction, objective of industrial safety, causes of accidents, common sources of accidents, preventive measures, and common safety methods.

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UNIT II

Carpentry Shop

Carpentry- Introduction, types of timbers, defects in timbers, timber prevention, characteristics of good timber, common tools used in carpentry shop (marking and measuring tools; cutting tools and striking tools), and common wood joints (cross-lap, corner-lap, dovetail and bridle joints).

UNIT III

Fitting Shop

Fitting- Introduction, tools used in fitting shop (measuring tools, holding tools, cutting tools, striking tools and supporting tools) and operation performed in fitting work.

UNIT IV

Welding Shop

Welding- Introduction, terminological elements of welding process, welding joints (lap joints and butt weld joint), welding positions, advantages and disadvantages of welding, classification of welding, gas welding processes and safety recommendation for gas welding.

UNIT V

Sheet Metal Shop

Sheet Metal- Introduction, metal used in metal work, sheet metal tools (hand shears or snips, hammers, stakes, cutting tools and measuring tools), folding terminology of metal sheet joint, folded sheet metal joints and sheet metal operations.

Text Books:

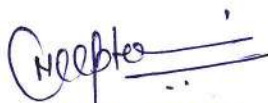
1. Manufacturing Technology by P. N. Rao
2. Workshop Technology by B.S. Raghuvansi
3. Introduction to Manufacturing Processes by Schey

References:

1. Production Technology by R.K. Jain
2. Principles of Manufacturing Material & Process by Campbeu
3. Welding: Principles & Practise by Bonhart
4. Welding and Welding Technology by Little
5. Principles of Foundry Technology by Jain

List Of Experiments:

1. To study various industrial safety precautions & preventive measures.
2. To study the various timber properties, its defects and its prevention.
3. To make various joints (L-joint, T-joint, Cross joint, etc.) using carpentry tools.
4. To perform various fitting shop operations using fitting tools.
5. To study various welding methods and its safety precaution.
6. To make various welding joints (Butt joints, Lap, joints, corner joints, etc).
7. To study sheet metal properties and safety precautions.
8. To make various shapes using sheet metal tools and terminologies.



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