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Choice Based Credit System (CBCS) in Light of NEP-2020
Diploma in Mechanical Engineering
(2023-2026)

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME401N	DC	Manufacturing Process II	60	20	20	30	20	2	1	0	3

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 Objective s(CEOs):
The subject aims to provide the student with:
1. Provide students with a comprehensive understanding of advanced manufacturing techniques and their economic and technological impact on industry.
2. Familiarize students with the role of automation, including CNC machines, Flexible Manufacturing Systems (FMS),
3. Familiarize students with Industry 4.0, emphasizing their role in optimizing production efficiency and quality in modern production.
4. Introduction of Micro manufacturing and nano manufacturing

Course Outcomes (COs):
Students will be able to:
1. Analyze the economic and technological impact of advanced manufacturing technologies on modern industrial practices, including the role of automation techniques like CNC and FMS.
2. Evaluate and apply advanced metal forming techniques such as micro-forming to meet precision manufacturing requirements.
3. Demonstrate knowledge of composite materials and surface engineering techniques.
4. Develop expertise in nano- and micro-manufacturing techniques and
5. Demonstrate Industry 4.0 concepts such as smart factories and digital manufacturing to the design and production of high-precision components.

Syllabus

UNIT I **8 Hrs.**

Manufacturing Techniques: Introduction and Importance of Manufacturing: Economic and technological impact on industry, types of production system, Automation in Manufacturing: Role of CNC machines, Flexible Manufacturing Systems (FMS), Lean Manufacturing and Six Sigma: Principles and their application in modern production. Introduction to Industry 4.0.

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Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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UNIT II **9 Hrs.**

Metal Forming Techniques: Introduction to forming: Principle, applications, and materials used, different types of modern forming techniques such as Explosive forming, magnetic pulse forming etc. Introduction to rolling process and types of rolling mills, micro-forming and nano-forming: techniques such as micro-extrusion, micro-stamping (micro-punching), micro-deep drawing micro-bending.

UNIT III **8 Hrs.**

Composite Materials Manufacturing: Classifications of materials**,** Introduction to Composites: Types (fiber-reinforced, particulate-reinforced, and hybrid etc.). forming of composites. Applications of Composites in Aerospace, Automotive, and Marine Industries.

UNIT IV **8 Hrs.**

Surface Engineering: Surface Engineering: Definition, importance, and applications, Surface Hardening Techniques: Case hardening, nitriding, and carburizing, Fundamentals of friction, wear, and lubrication. Wear types: Adhesive, abrasive, erosive, corrosive.

UNIT V **9 Hrs.**

Nano-Manufacturing and Micro-Manufacturing: Introduction to Nano-Manufacturing: Fundamentals and importance, Techniques for Nano-Manufacturing: Lithography, chemical vapor deposition. Micro-Manufacturing: Micro-machining, micro-molding, Applications of micromanufacturing.

Reference Books:

1. Groover, Mikell P. *Automation, Production Systems, and Computer-Integrated Manufacturing*. Pearson, 4th Edition, 2015.
2. Womack, James P., & Jones, Daniel T. *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. Free Press, Updated Edition, 2003.
3. Gilchrist, Alasdair. *Industry 4.0: The Industrial Internet of Things*. Apress, 1st Edition, 2016.

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

4. Hosford, William F., & Caddell, Robert M. *Metal Forming: Mechanics and Metallurgy*. Cambridge University Press, 4th Edition, 2011.
5. Chirita, Ionel, & Chirita, George. *Handbook of High-Energy Metal Forming Processes*. CRC Press, 1st Edition, 2021.
6. Chawla, Krishan K. *Composite Materials: Science and Engineering*. Springer, 3rd Edition, 2012.
7. Campbell, Flake C. *Manufacturing Processes for Advanced Composites*. Elsevier, 1st Edition, 2003.
8. Davis, J.R. *Surface Engineering for Corrosion and Wear Resistance*. ASM International, 1st Edition, 2001.
9. Mattox, D.M. *Handbook of Physical Vapor Deposition (PVD) Processing*. Elsevier, 2nd Edition, 2010.
10. Ahmed, Waqar, & Jackson, Mark J. *Nano-Manufacturing Handbook*. CRC Press, 1st Edition, 2009.
11. Qin, Yi. *Micromanufacturing Engineering and Technology*. Elsevier, 2nd Edition, 2015.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME402	DC	THEORY OF MACHINES	60	20	20	30	20	2	1	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 20 marks.

Course Educational Objectives (CEOs):

(A)To familiarize students with basic types of mechanisms, joints and degrees of freedom to perform position, velocity and acceleration analysis using graphical and analytical methods. (B) To provide students an understanding of different types of mechanisms and toteachthebasicsofsynthesisofsimplemechanismsandalsoteachstudentsthekinematic analysis of cam-follower motion. (C) To provide basic concept gyroscope, which allows the calculation of orientation and rotation; designers have incorporated them into modern technology.

Course Outcomes (COs):

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

1. Students will be able to define systematically design and develop mechanisms to perform a specified task and demonstrate an understanding of the concepts of various mechanisms and pairs.
2. Students will be able to do the velocity and acceleration analysis of simple mechanisms.
3. Students will be able to explain effectively present written, oral, and graphical solutions to design problems & develop ability to come up with innovative ideas and design a layout of cam for specified motion.
4. Students will be able demonstrate an understanding of principle of gears.
5. Students will be able to synthesis simple gyroscopic forces and couple, and gyroscopic effect in airplanes, ship and vehicle.

Syllabus: -

UNIT- I **9 Hrs.**

Simple Mechanism: Introduction of theory of machines; definitions of statics, dynamics, kinematics, kinetics, kinematic pair, kinematic chain, mechanism, machine inversions, relation between number of links, number of joints and number of pairs; Four bar chain and its inversion; Slider crank chain and its inversions.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME402	DC	THEORY OF MACHINES	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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UNIT-II **8 Hrs.**

Cams and Followers: Need, Classification, motion of follower; Displacement, velocity and acceleration diagrams uniform velocity, uniform acceleration, and retardation.

UNIT-III **9 Hrs.**

Brakes and Dynamometers: Brakes-Need, types, braking force, braking torque; Band brakes; block brakes; Band and Block brakes; internally expanded brakes; Dynamometers-Need, Types, principles, Construction and working.

UNIT-IV **8 Hrs.**

Power Transmission: Classification of power transmission devices, belt drive, chain drive, rope drive and gear drives; Flat and 'V' belt drives; ratio of tensions; Slip length of belt calculation for open and cross belt drive.

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UNIT-V **9 Hrs.**

Governors: Classification of governors, Watt governor, porter governor, proell governor and Hartnell governor-their construction and working; Sensitivity; stability; power and effort; hunting phenomenon and isochronous governor.

Reference Books:

1. *S.S. Rattan, "Theory of Machines", Third Edition, TataMcGraw-Hill, 2009.*
2. *Ambekar A.G, "Mechanism and Machine Theory" Prentice Hall of India", New Del hi,2007.*
3. *Rattan SS; "Theory of machines"; MC GrawHills, 2014.*
4. *Ambekar AG; "Mechanism and Machine Theory; PHI. Eastern Economy Edi tion",2015.*
5. *Rao J S and Dukkipati; "Mechanism and Machine Theory"; New AgeDelhi, 2011.*

List of Practical's:

1. To finds out gyroscopic couple.
2. To Find out velocity & acceleration of slider crank mechanism by Klien" s

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME402	DC	THEORY OF MACHINES	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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Construction.

3. To find out velocity ratio of various geartrains
4. To study various types of belt drives & find out the velocity ratio of the drive.
5. To draw the cam profile.
6. Study of working models of various popular mechanisms like quick return mechanism etc
7. To draw Involute profile of a gear by generating method.
8. Study of the mechanisms like Pantograph mechanism, Davis & Ackerman's steering mechanisms etc.

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COURSE CODE	CAT-EGO-RY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME403N	DC	Design of Machine Elements	60	20	20	30	20	2	1	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):
1. To understand the design methodology for machine elements.
2. To analyze the forces acting on a machine element,
3. Apply suitable design methodology.
4. To understand the various standards and methods of standardization.
5. To apply the concept of parametric design and validation by strength analysis

Course Outcomes (COs):
Students will:
1. Understand the design concepts of various machine elements.
2. Design for fatigue and endurance limit
3. Design the shafts and couplings.
4. Design the various types of springs.
5. Understand the concepts of bearing lubrication and design the journal bearings.

Syllabus

UNITI **8 Hrs.**

Introduction: Introduction to Design process, Design considerations, Design Procedure, engineering materials properties and processes of their selection, Bending and Torsional stress equations, Stress concentration, causes of stress concentration factor, reduction of stress concentration.

UNITII **9 Hrs.**

Design for fatigue strength and endurance limit: fatigue, cyclic loading, endurance limit, Design consideration for fatigue, stress concentration factor, loading factor, size factor, surface factor, Goodman and modified Goodman's diagram, Soderberg equation, Gerber parabola.

UNITIII **10 Hrs.**

Design of Shafts: Various types of shafts; Stresses in Shafts; Design of shafts (solid and hollow) subjected to torque and bending moment.

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COURSE CODE	CAT-EGO-RY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME403N	DC	Design of Machine Elements	60	20	20	30	20	2	1	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.

keys and Coupling: Definition of term key, its various types, Design of keys, Forces acting on sunk keys, Shaft coupling and its various types.

UNITIV **8 Hrs.**

Design of Springs: Introduction and types of springs, Material for helical spring, terms used in compression springs, stresses in helical spring, Design of helical compression & tension spring, leaf spring, fatigue loading of springs, surge in springs.

UNITV **9 Hrs.**

Journal Bearing: Types of lubrication, viscosity, hydrodynamic theory, design factors, temperature and viscosity considerations, Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings, Rolling-element Bearings: Types of rolling contact bearing, bearing friction and power loss, bearing life.

Text and Reference Books:

1. Design of Machine Elements by V.B. Bhandari, TMH, 3rd Ed. 2010.
2. Machine Design by R.S. Khurmi nad J.K. Gupta, Eurasia Pub. House, 2013.
3. Machine Design by LE. Shingley, TMH, 2011.
4. Design of Machine Elements by Sharma and Purohit, PHI, 2014.
5. Machine Design by Wentzell Timothy H., Cengage learning, 2008.
6. Machine Design by Mubeen, Khanna Pub. 2013.
7. Machine Design by Sharma and Agrawal, Kataria & Sons, 2016.

List of Experiments.

Solve various design problems as per the syllabus.
Designing of components contained in the syllabus.

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COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME404	DC	Fluid Mechanics	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 20 marks.

Course Educational Objectives (CEOs):
This course will provide the knowledge of (A) Fluid and its properties, (B) behavior of fluid under various conditions, (C) Water turbine and pumps, (D) Applications.

Course Outcomes (COs):
After the successful completion of this course students will be able to
1. Understand the fundamentals of fluid mechanics.
2. Understand basics of compressible flow.
3. Understand fundamentals of flow through pipes.
4. Understand statics, dynamics and various approaches to fluid mechanics.
5. Understand the working of hydraulic turbine and centrifugal pump.

1. .

Syllabus

UNIT-I **8 Hrs.**
Properties of fluid: Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility. Fluid Pressure & Pressure Measurement: Fluid pressure, Pressure head, Pressure intensity, Concept of vacuum and gauge pressures, atmospheric pressure, absolute pressure, Simple and differential manometers.

UNIT -II **8 Hr.**
Fluid Flow:
Types of fluid flows, Path line and Stream line, Continuity equation, Bernoulli's theorem, Principle of operation of Venturi meter, Orifice meter and Pitot tube, Derivations for discharge, coefficient of discharge and numerical problems.

UNIT – III **7 Hr.**
Impact of jets:
Impact of jet on fixed vertical, moving vertical flat plates, Impact of jet on curved vanes with special reference to turbines & pumps, Simple Numerical on work done and efficiency.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME404	DC	Fluid Mechanics	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 20 marks.

UNIT – IV **8 Hr.**

Hydraulic Turbines:

Layout of hydroelectric power plant, Features of Hydroelectric power plant, Classification of hydraulic turbines, Selection of turbine on the basis of head and discharge available, Construction and working principle of Pelton wheel, Francis and Kaplan turbines, Draft tubes– types and construction, Concept of cavitation in turbines.

UNIT -V **7 Hr.**

Centrifugal Pumps and Compressor:

Principle of working and applications, Types of casings and impellers, Priming and its methods, Cavitation, Manometric head, Work done, Manometric efficiency, Overall efficiency. Types of compressors, construction and working of centrifugal compressor.

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. kataria & Sons, 2015.
2. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications, 2016.
3. Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S. Chand & Co., 2017.
4. Fluid Mechanics by F. M. White, 5th ed., McGraw-Hill, New York, 2007.
5. Fundamentals of Fluid Mechanics by Munson, Willey India, 2012.
6. Fluid Mechnaics by A.K. Mohanty, PHI Learning Pvt. Ltd., 2011
7. Textbook of Fluid Mechanics by Suparna Mukhopadhyay, CBS Pub. 2015.
8. “Turbo machinery" by Vcnkanna BK; Publisher: PHI, 2012.
9. "Turbo machinery" by Shepherd DG; 2005.

List of practical: -

1. Verification of Bernoulli's Theorem.
2. To study the velocity of flow using Pitot tube.
3. To determine the Coefficient of discharge through different flow meters. (Any two out of Orifice meter, Venturi meter and Nozzle meter.)
4. To study the characteristics of a centrifugal pump.
5. To study of Pelton Turbine.

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DTME404	DC	Fluid Mechanics	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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6. To study of Francis Turbine.
7. To study of Kaplan turbines.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME405N	BEC	**Computer Aided Technology Lab**	0	0	0	30	20	0	0	4	**2**

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):

Students will be able to design, model, and assemble mechanical components while applying solid and surface modelling techniques to produce professional engineering drawings.

Course Outcomes (COs):

After completion of this course the student are expected to be able to demonstrate following knowledge skills and attitudes. The student will be able to

1. Students will be able to Design complex 2D and 3D models using basic and advanced CAD commands.
2. Students will be able to Create effective 2D drawings with layers, blocks, annotations, and layout setups.
3. Students will be able to Develop and modify complex surface models using advanced surface modelling techniques.
4. Students will be able to Assemble components, apply constraints, and conduct analysis for functional validation.

Unit I

Introduction: Introduction to CAD, Why CAD Software, Scope, objective, benefit, limitation & evaluation; Engineering Design process, Considerations, Product Design Cycle, Digital Prototyping, Product development today.

Unit II

Graphics Fundamentals: CAD Interface, coordinate system, Creating, Creating Additional Drawing Objects, Inquiry Commands, Modify and Manipulating Objects, Construction and Reference Geometry, Hatching Objects, Layers & Blocks, Text, Table & Dimensions, Printing, Plotting, Layouts and view ports.

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Diploma in Mechanical Engineering
(2023-2026)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTME405N	BEC	**Computer Aided Technology Lab**	0	0	0	30	20	0	0	4	**2**

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

Solid Modelling: Introduction, Types of models, Construction of 3D Solid Primitives, create 3D Solids from Objects, Extrude, Revolve, Sweep, Loft, Combine or Slice 3D Objects, Move Rotate & Scale 3D Objects, Object Sectioning, Save and Publish Section Objects Wire Frame Models, Wire frame Entities.

Unit IV

Surface Modelling: Introduction to Surface Modelling, Difference between solid and surface modelling, Surface Creation Techniques and tools; Sweep, Loft, and Revolve, Boundary blend Surfaces, Planar Surface, Network Surface, Surface from Mesh, Variable Section Sweep, Surface Blend and Patch. Modifying surfaces with Control Vertices and NURBS, Trimming and Merging, surfaces. Surface visualization and rendering.

Unit-IV

Parts Assembly, Visualization & Graphics Standards: Introduction to assembly modeling, Generation of Assembling Sequences - Precedence Diagram Parent-child relationships, Assembly constraints; Mate, Align, Insert, and Tangent. Assembly operations; Inserting components, defining constraints, modifying and Mechanism Analysis. Creating Visual styles, Materials and Texture, Light Effect, Camera & Animation.
Data exchange standards – IGES – STEP – CALS – DXF – STL

Reference Books:

1. *AutoCAD 2024: A Problem-Solving Approach, Basic and Intermediate by Sham Tickoo, CAD CAM CIM Technologies.*
2. *AutoCAD 2024 For Dummies by Bill Fane and David Byrnes, Wiley.*
3. *Mastering AutoCAD 2024 and AutoCAD LT 2024 by Brian C. Benton and George Omura, Sybex.*
4. *PTC Creo Parametric 3.0 for Designers, Author Tickoo S, Textbooks Published by BPB*
5. *SOLIDWORKS 2017 for Designers, Author Tickoo S, Textbooks Published by BPB*
6. *CATIA V5-6R2016 for Designers, Author Tickoo S, Textbooks Published by BPB*
7. *Autodesk Inventor Professional 2017 for Designers, Author Tickoo S, Textbooks Published by BPB*

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Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) Scheme in light of NEP2020
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List of Practical's:

1. Create a flowchart illustrating the engineering design process.
2. Design a complex 2D mechanical component using draw and modify commands.
3. Create a drawing using multiple layers, blocks, and text annotations with different font styles.
4. Create a layout with multiple viewports and set up the drawing for plotting or printing.
5. Create a 3D model using solid primitives such as cube, cylinder, and sphere.
6. Create a 3D object using the extrude, revolve, and loft commands from 2D sketches.
7. Section a 3D object using the slice command and modify its properties.
8. Create complex surfaces using tools like sweep, loft, and boundary blend.
9. Create a surface model, using mesh operations and Nurbs creation.
10. Assemble multiple components using constraints like mate, align, insert, and tangent.
11. Conduct interference and motion analysis on an assembly model to validate constraints.
12. Apply materials, textures, and light effects to an assembly and generate a rendered image.

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