DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,

CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A^{+}' Grade

CIRCULAR NO.SS/ Sci & Tech./ B.Voc /14 /2025.

It is hereby inform to all concerned that, on recommendation of the Dean, Faculty of Science & Technology **Academic Council at its meeting held on 21 July, 2025 has been accepted the revised syllabi of following *Curriculum at UG Level* as per National Education Policy-2020" *1. B.Voc in Industrial Automation, 2. Automobile Division,*** (revised) ***of under*** **the Faculty of Science & Technology run at the Department, Deen Dayal Upadhyay Kaushal Kendra, Dr. Babasaheb Ambedkar Marathwada University as appended herewith.**

This is effective from the Academic Year 2025-26 onwards under the Faculty of Science & Technology.

All concerned are requested to note the contents of the circular and bring notice to the students, teachers and staff for their information and necessary action.

University campus,
Chhatrapati Sambhajinagar-431004.
Ref. No. S S/Sci & Tech/B.Voc./2025-26/
Date: 01/ 08/ 2025 1436-38

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Deputy Registrar,
Syllabus Section

Copy forwarded and Information to necessary action:-

1] **The Director, Department, of, Deen Dayal Upadhyay Kaushal Kendra, Dr. Babasaheb Ambedkar Marathwada University.**

2] **The Director, Board of Examination & Evaluation,**

3] **The Director,** University Network & Information Centre, UNIC, with a **request to upload this circular on University Website.**
Dr. Babasaheb Ambedkar Marathwada University **Chhatrapati Sambhajinagar.**

Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 431001

B.VOC. Degree Program

(Three Year)

SEMESTER-III

DDU KAUSHAL Kendra
Automobile Division

(Revised)

(AS PER NEP-2020)

Subject (Major): Automobile

Effective from 2025-26

17/2025

B.VOC. Second Year: 3rd Semester

Students will have to select / declare choice of **one major subject** and **one minor subject** from three major options M1, M2 and M3 (which were opted in the first year)

Course Type	Course Code	Course Name	Teaching Scheme (Hours / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) Mandatory	AU/DSC/T/200	Automobile Transmission	2		2		2+2+2+2 = 08
	AU/DSC/T/201	Hydraulics and Pneumatics	2		2		
	AU/DSC/P/226	Practical based on AU/DSC/T/200		4		2	
	AU/DSC/P/227	Practical based on AU/DSC/T/201		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	Mn-1	To be chosen from other discipline of same faculty	4		4		04
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	AU/GE/OE /T/200	To be chosen from other faculty	2		2		02
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	AU/VSC/T/200	Manufacturing Processes	1		1		1+1 =02
	AU/VSC/T/201	Electric Motors	1		1		
	AU/VSC/P/226	Practical based on AU/VSC/T/200		2		1	
	AU/VSC/P/227	Practical based on AU/VSC/T/201		2		1	
AEC, VEC, IKS	AU/AEC/T/200	English (Common for all the faculty)	2		2		02
	AU/VEC/T/201	Environmental Studies	2		2		02
OJT/ FP/CEP/CC/RP	CC-3	Cultural Activity / NSS,NCC (Common for all the faculty)		4		2	02
			15	**14**	**15**	**07**	**22**

Minor Courses for other Discipline

AU/Mn/T/200 (Workshop Technology) and AU/Mn/T/201 (Engineering Drawing) are 2 courses of 2 credits each designed for other discipline.

Generic /Open Elective Courses for other faculty

AU/GE/OE/200 (Hydraulics and Pneumatics: 2 credit theory course to be designed for other faculty.

B.VOC. Second Year: 4th Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) Mandatory	DSC-17	Electric & Hybrid Vehicles	2		2		2+2+2+2 = 08
	DSC-18	Automotive HVAC	2		2		
	DSC-19	Practical based on DSC-17		4		2	
	DSC-20	Practical based on DSC-18		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	Mn-2	To be chosen from other discipline of same faculty			4		04
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	GE/OE-4	Motor Vehicle Act	2		2		02
SEC (Skill Enhancement Courses) (Choose any one from pool of courses)	SEC-3	1. Computer Aided Manufacturing 2,Automobile Sensors	1		1		1+1 =02
	SEC-4	Practical based on SEC-3		2		1	
AEC, VEC, IKS	AEC-4	Modern Indian Language (MIL-2) (Common for all the faculty)	2		2		02
OJT/ FP/CEP/CC/RP	FP-1	Field Project		4		2	2+2= 04
	CC-4	(Fine/ Applied/ Visual/ Performing Arts) (Common for all the faculty)		4		2	
			13	**18**	**13**	**09**	**22**
Exit Option : Award of UG Diploma in major and minor with 88 credits and an additional 4 credits NSQF course (related to major / minor) / Internship during summer vacation OR Continue with Major and Minor							

Minor Courses for other Discipline

AU/Mn/T/250 (Automotive Materials) and AU/Mn/T/251 (Basic Electronics System) are 2 courses of 2 credits each designed for other discipline

Generic /Open Elective Courses for other faculty

AU/GE/OE/250 (Electric and Hybrid Vehicle): 2 credit theory course to be designed for other faculty.

AU/DSC/T/200 Automobile Transmission

Total Credits : 02 Total Contact Hours : 30
Maximum Marks : 50

Course Objectives:
To introduce Student with Automobile Transmission System along with key important concepts of Manual, Automatic and Differential.

Course Outcomes (CO):
1. Identify the components of transmission system.
2. Demonstrate the functional requirement of automobile transmission
3. Explain working of Electronic Automatic Transmission

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H	M							H		
CO2	M	H	M		M				M	M	
CO3		M		M					M	H	M

Module No.	Topics / actual contents of the syllabus	Contact Hours
Unit - I **Transmission Elements**	Introduction, Transmission gears, drive Shaft, Belt, Couplings, Pulley, Bearings, **Clutch**:- Necessity, Requirements of Clutch, Principle of friction Clutch, Types of Clutch - construction and working of Single plate Clutch, Multi plate clutch, Diaphragm Clutch, desirable properties of clutch material	**10 Hours**
Unit- II Manual Transmission	**Necessity of Gear box** in Automobile Transmission System, Functions of Gear box, Types of Gear box, Construction and Working - a) Sliding mesh Gearbox, b) Constant mesh Gearbox, c) Synchro- mesh Gearbox, Introduction to Manual Transaxle, Basic transaxle construction, Power flow through a transaxle, CV joints, Differential action	**10 Hours**
Unit- III Automatic Transmission	Automatic Transmission- necessity of automatic transmission, Construction and working of a) Torque Converter b) Overdrive Continuously Variable Transmission (CVT) - Principle, construction and working, advantages and disadvantages	**10 Hours**

References:

1. Automotive Technology Manual Transmission, Jack Erjavec, Cengage Learning, ISBN-10: 81-315-1423-8, ISBN-13: 9788131514234
2. Automotive Mechanics: William H. Crouse. Donald L. Anglin: Tata McGraw Hill 10th edition ISBN: 9780070634350.
3. Basic Automobile Engineering: C P Nakara: Dhanpatrai publication ISBN-10:9352160983.
4. Automotive Mechanics: S Shrinivasan: Tata McGraw Hill Second edition ISBN10 8187433221.
5. Automobile engineering Vol-II: Dr. Kripal Singh: Standard Publisher distributers ISBN- 10: 818014196

AU/DSC/T/201 : Hydraulics and Pneumatics

Total Credits: 02 Total Contact Hours: 30

Maximum Marks: 50

Course Objectives:

- To impart fundamental knowledge of hydraulic and pneumatic systems.
- To develop the ability to design and troubleshoot fluid power circuits.
- To understand fluid system components, ISO symbols, and safety practices.

Course Outcomes (CO):

CO No.	Course Outcome Description
CO1	Understand principles, advantages, and components of fluid power systems.
CO2	Analyze and differentiate various hydraulic and pneumatic components and circuits.
CO3	Design and simulate basic fluid power circuits for industrial applications.

CO-PO Attainment Matrix for Course (L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H	M							H		
CO2	M	H	M						H	M	
CO3		M	H	H	H				M	H	M

Module No.	Topics / actual contents of the syllabus	Contact Hours
Unit I: Introduction to Fluid Power Systems	• Basics: Hydraulics vs Pneumatics • Applications, advantages, disadvantages • Properties of fluids: Compressibility, viscosity, density • Energy and power in fluid systems • ISO and SAE grades of oil • ISO symbols in hydraulic and pneumatic systems • Safety and hazards in fluid systems • Pascal's law, Bernoulli's principle (brief overview)	**10 Hours**
Unit II: Pumps and Actuators	• Classification and working of pumps: Gear, Vane, Screw, Piston (axial & radial) • Pump performance curves, efficiency, cavitation • Selection and maintenance of pumps	**10 Hours**

	• Control valves: Directional, flow, pressure • Actuators: Linear and rotary types • Reservoirs, accumulators, filters, hoses, seals and fittings	
Unit: -III Pneumatic System Components	• Compressors: Reciprocating, rotary, screw types • Air treatment: Filters, regulators, lubricators (FRL unit) • Pneumatic actuators: Single/double-acting cylinders, telescopic, rotary • Pneumatic valves: 2/2, 3/2, 5/2, 5/3 types • Flow and pressure control valves • Basic hydraulic circuits: Meter-in, meter-out, bleed-off • Introduction to electro-pneumatics and logic valves	**10 Hours**

Reference Books:

1. Andrew Parr, *Hydraulics and Pneumatics*, Elsevier/Newnes
2. S.R. Majumdar, *Pneumatic Systems*, Tata McGraw-Hill
3. Anthony Esposito, *Fluid Power with Applications*, Pearson Education
4. Jagadeesha T., *Introduction to Hydraulics and Pneumatics*, I.K. International
5. Herbert E. Merritt, *Hydraulic Control Systems*, Wiley
6. Pippenger & Hicks, *Industrial Hydraulics*, McGraw-Hill

AU/VSC/T/200: Manufacturing Processes

Total Credits : 01 Total Contact Hours :15
Maximum Marks :25

Course Objectives: To provide students with a fundamental understanding of various conventional and non-conventional manufacturing processes, including sheet metal forming and cutting, and to equip them with the principles of tool & die making.

Course Outcome (CO):

1. Design and construction of jigs and fixtures for industrial applications.
2. Explain the working principle of non-conventional machining processes.
3. To identify the sheet metal operations.

CO-PO Attainment Matrix for Course (L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CO1	H							H		
CO2		H		M					M	M
CO3			M		M			M		

Module No.	Topics / actual contents of the syllabus	Contact Hours
Unit:-I Sheet Metal & Operations	**Introduction to Sheet Metal:** Properties of sheet metal, Raw material information for common sheet metal. **Cutting Operations:** Shearing, Punching, Blanking and Trimming, Notching, Lancing **Forming Operations:** Bending, Drawing, Stamping, Stretch Forming, Metal Spinning: Deep Drawing	4 Hours
Unit:-II Die and fixture	**Introduction to Tool & Die Making**: role of press tools, jigs, and fixtures, their importance in manufacturing, and industry applications, Simple Die, Combination Die, Progressive Dies; Dies and Fixtures Design, Jigs and Fixtures Construction	6 Hours
UNIT-III Non-Traditional Machining	**Introduction to Non-Traditional Machining:** Need for NTM processes, Comparison with conventional machining. **Abrasive Jet Machining (AJM):** Principle of operation. **Ultrasonic Machining (USM):** Principle of operation, Applications. **Electrochemical Machining (ECM):** Principle of operation. Equipment and tooling. **Electrical Discharge Machining (EDM):** Principle of operation. Equipment and process parameters. Applications. **Laser Beam Machining (LBM):** Principle of operation. Equipment and mechanism of metal removal. Process parameters	5 Hours

References:

1) Workshop Technology (Manufacturing Processes)" by R.S. Khurmi and J.K. Gupta
2) Manufacturing Processes" by J.P. Kaushish:
3) Manufacturing Processes" by P.N. Rao:
4) "A Textbook of Workshop Technology (Manufacturing Processes)" by R.S. Khurmi and J.K. Gupta

AU/VSC/T/201: Electric Motor

Total Credits: 01 Total Contact Hours :15
Maximum Marks :25

Course Objectives: To provide a comprehensive understanding of the principles of operation, construction, characteristics, control, and applications of various types of DC, AC, and BLDC electric motors.

Course Outcomes (CO): After completion of course, student must be able to:

1. Select Motor for particular application
2. Demonstrate the construction and working principle of DC, AC, and BLDC motor.
3. Explain application and uses of Special Purpose Electric Motors.

CO-PO Attainment Matrix for Course (L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H								H		
CO2		M	M		H					M	
CO3				M					M		M

Module No.	Topics / actual contents of the syllabus	Contact Hours
Unit:-I DC Motors	**DC Motors and Fundamentals of Electromechanical Energy Conversion**: Introduction to Electromechanical Energy Conversion: Basic principles, **DC Generators (Brief Review/Foundation for Motors):** Constructional features, **DC Motors: Principles and Characteristics:** Principle of operation: Torque production in a DC motor **Starting and Speed Control of DC Motors:** Necessity of starters for DC motors.	**5 Hours**
Unit: -II AC Motors	Three-Phase Induction Motors; Fundamentals; Constructional features: Stator, Rotor, Air gap. Principle of operation. Torque and Performance Characteristics of Three-Phase Induction Motors. Starting and Speed Control of Three-Phase Induction Motors. Single-Phase Induction Motors	**4 Hours**
UNIT-III Special Motors	**BLDC Motors and Other Special Purpose Motors Brushless DC (BLDC) Motors:** Introduction, Construction, Principle of operation, Driving methods for BLDC motors. **Stepper Motors:** Introduction to stepper motors: Principle of operation, Types, **Servo Motors:** Introduction to servo motors: Components Types: Principle of operation. **Other Special Purpose Motors** Reluctance Motors: Principle and applications. Hysteresis Motors: Principle and applications. Linear Induction Motors: Principle and applications. Switched Reluctance Motors (SRM), Universal Motor	**6 Hours**

References:

1) Electrical Technology, Volume II: AC and DC Machines" by B.L. Theraja and A.K. Theraja:
2) Electrical Machines" by P.S. Bimbhra:
3) Electrical Machines" by D.P. Kothari and I.J. Nagrath

AU/DSC/P/226 Practical Based on Automobile Transmission

Total Credits: 02 Total Contact Hours: 30
Maximum Marks: 50

Course Outcomes (COs):

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

I. Perform Trouble shooting of clutch assembly
II. Perform Trouble shooting of gearbox assembly

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1			H							M	
CO2			H						M		

List of Experiments (Any 6)

Job sheets

- Perform Trouble Shooting Of Clutch Assembly
- Perform Inspection and Service of Clutch Linkages
- Perform Service of Hydraulic Clutch
- Perform inspection and service of clutch
- Remove and Install a Transmission Unit
- Disassemble and Reassemble a Typical Transaxle
- Perform Servicing Of Gears and Synchronizer
- Perform Road Testing On Vehicle to Identify Transmission Problem
- Perform Inspection and Adjustment of Shift Linkages
- Perform Replacement of Transmission Oil
- Perform Diagnosis of Transmission Noise Problem
- Perform Service of Companion Flange and Pinion Seal Service
- Perform Measurement and Adjustment of Pinion Depth Bearing Preload and Backlash
- Perform Servicing of Ring and Pinion Gear
- Perform Servicing Of Center Support Bearing
- Perform Differential Case Service
- Perform Testing of Transmission Sensors and Switches
- Describe Operation of Electronic Controlled Transmission

AU/VSC/P/226 Practical Based on Manufacturing Processes

Total Credits: 01
Maximum Marks: 25

Total Contact Hours: 30

Course Outcomes (COs):

- **After completion of the course, students will be able to –**

Apply foundational knowledge of engineering materials and conventional sheet metal and machining processes, coupled with principles of tool & die design and construction, to effectively analyze, select, and utilize appropriate manufacturing techniques, including non-traditional machining processes, for producing components in various industrial applications.

CO-PO Attainment Matrix for Course (L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1											
CO2	H			M					M		
CO3		M								M	

List of Practical (Any 4)

1. Investigation of Material Properties and Cutting Force in Sheet Metal Shearing and Punching Operations
2. Comparative Study of Bending Methods: Spring back Analysis and Die Design Considerations Design and Assembly of Simple Jigs and Fixtures for a Given Machining Operation:
3. Parameter Optimization and Surface Finish Analysis in Electrical Discharge Machining (EDM
4. Industry Visit: Observing Advanced Sheet Metal Fabrication Processes and Tooling in a Manufacturing Plant
5. Industry Visit: Exploring Applications of Non-Traditional Machining (NTM) Technologies in a High-Precision Manufacturing Facility

AU/VSC/P/227 Practical Based on Electric Motor

Total Credits: 01 Total Contact Hours: 30
Maximum Marks: 25

Course Outcomes (COs):

- **After completion of the course, students will be able to –**

  Analyze and explain the fundamental principles of electromechanical energy conversion and apply them to understand the operation, characteristics, and control of various DC, AC (Induction and Synchronous), BLDC, and other special purpose motors, enabling them to select and apply appropriate motor types for diverse engineering applications.

CO-PO Attainment Matrix for Course (L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	M								H		
CO2	H		M							M	
CO3		H			M				M		

List of Practical (Any 4)

1. Experiments on DC Motors Speed control, and Load test.
2. Experiments on Three-Phase Induction Motors No-load, Load test and Speed control methods.
3. Experiments on Single-Phase Induction Motors Performance analysis of capacitor start/run motors.
4. Experiments/Demonstration on BLDC Motors Electronic commutation, Speed control using PWM.
5. Demonstration/Simulation: Stepper motor control, Servo motor control.
6. Motor Selection Case studies and design considerations for selecting appropriate motors for specific industrial and consumer applications (e.g., robotic arm, electric bicycle, washing machine).

AU/DSC/P/227: Practical based on Hydraulics and Pneumatics

Total Credits: 02 Total Contact Hours: 60
Maximum Marks: 50

Course Objectives:

- To impart fundamental knowledge of hydraulic and pneumatic systems.
- To develop the ability to design and troubleshoot fluid power circuits.
- To understand fluid system components, ISO symbols, and safety practices.

Course Outcomes (CO):

CO No.	Course Outcome Description
CO1	Understand principles, advantages, and components of fluid power systems.
CO2	Analyze and differentiate various hydraulic and pneumatic components and circuits.
CO3	Design and simulate basic fluid power circuits for industrial applications.

CO-PO Attainment Matrix for Course (L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H	M							H		
CO2	M	H	M						H	M	
CO3		M	H	H	H				M	H	M

List of Practical: (Any 6)

1. To study Bernoulli's Equation for real fluids.
2. To study flow through Venturimeter.
3. To Study pneumatic cylinder for given load and speed requirement
4. To study pneumatic circuit to operate direct single acting cylinder
5. To Study pneumatic circuit to operate direct double acting cylinder
6. To study pneumatic circuit to operate indirect single acting cylinder
7. To Study pneumatic circuit to operate indirect double acting cylinder

AU/Mn/T/200 : Workshop Technology

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:

To introduce students with basic automobile concepts like

i. Four stroke engines,
ii. Engine lubrication system,
iii. Engine cooling system,
iv. Fuel injection system and ignition systems

Course Outcomes (COs) :

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

i) Explain Manufacturing Machines used in automobile workshop.
ii) Recommend Machines and manufacturing process for different automotive components.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Forming and Metal Joining Methods:** Drop forging: open die & closed die forging, forging operations. Rolling: Principle of rolling, hot & cold rolling, Extrusion: Direct & indirect extrusion. Gas welding, carbon arc welding, shielded metal arc welding, TIG welding, MIG welding, plasma arc welding, resistance welding types spot, seam projection. Electron beam welding, laser beam welding, Soldering and Brazing	**10 Hrs**
II	**Casting Processes:** Pattern making: Basic steps in making casting, Pattern: types, materials and allowances, Moulding: Types of moulding sands, properties of sand, moulding methods, cores and core prints, elements of gating system, Casting: Furnaces: Construction and working of cupola furnace, Centrifugal casting, shell moulding, investment casting, Casting defects - Causes & remedies	**10 Hrs**
III	**Machining Operations:** Lathe Machine: Introduction, classification and basic parts of center lathe & their functions, Lathe operations like facing, plain turning, taper turning, thread cutting, chamfering, grooving, knurling. Cutting tool nomenclature & tool signature, Drilling Machine Introduction, classification, basic parts of radial drilling machine and their functions, twist drill nomenclature, drilling machine operations like drilling, reaming, boring, counter sinking, counter boring, spot facing. Cutting parameters.	**10 Hrs**

Text Books:

1. B. S. Raghuwanshi. "Workshop Technology" Vol-I & Vol-II: Dhanpat Rai& Co.
2. S. K. Hajra Choudhari. A. K. Hajra Choudhari, "Workshop Technology Vol-I and Vol-II": Nirjhar Roy :Media Promoters and Publication Pvt.Ltd
3. W.A.J. Chapman, "Workshop Technology Vol-III":

Website Links:

1. https://www.youtube.com/watch?v=jdFrBtHeJbs&list=PLtAjRFb9nXmzRwSuuYmUoIxIQOu5ccdM_&ab_channel=Fundamentalsofmanufacturingprocesses

NPTEL/SWAYAM Courses:

1. Fundamentals of manufacturing processes

AU/Mn/T/201 : Engineering Drawing

Total Credits : 02 Total Contact Hours: 30 Hours
Maximum Marks : 50

Learning Objectives of the Course:

To introduce students with concepts like
i. Orthographic projections,
ii. Job drawing in shop floor,

Course Outcomes (COs) :

After completion of the course, students will be able to -
i) Know the importance of drawing standards and drawing basics to prepare drawing vehicle
ii) Demonstrate ability to prepare projections of points, lines, planes.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Drawing and Orthographic projections:** Drawing standard, Types and convention of lines and their applications, Letters and numbers (single stroke vertical), Dimensioning technique Introduction to Orthographic projections, Conversion of pictorial view into Orthographic Views (First Angle Projection Method Only) – elevation, plan and end view, Selection of section plains and drawing sectional view (simple object)	**10 Hrs**
II	**Projections Lines and Planes:** Projection of lines parallel and perpendicular to one or both planes, projection of lines inclined to one or both planes. Projection of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.	**10Hrs**
III	**Isometric projections:** Isometric scale, comparison of true scale with isometric scale, Conversion of orthographic views into isometric View / projection	**10 Hrs**

Text Books:

1. N. D. Bhatt, "Engineering Drawing", Charotar Publishing House, Anand, India.
2. K. V. Nataraajan, A text book of Engineering Graphic, Dhanalakshmi Publishers, Chennai, 2006
3. N. H. Dubey, A text book of Engineering Drawing, Nandu Publishers,

Website Links:

1. https://www.youtube.com/results?search_query=engineering+graphics+NPTEL

NPTEL/SWAYAM Courses:

1. Engineering Drawing 2. Engineering Graphics

AU/GE/OE/T/200 : Hydraulics and Pneumatics

Total Credits: 02 Total Contact Hours: 30

Maximum Marks: 50

Course Objectives:

- To impart fundamental knowledge of hydraulic and pneumatic systems.
- To develop the ability to design and troubleshoot fluid power circuits.
- To understand fluid system components, ISO symbols, and safety practices.

Course Outcomes (CO):

CO No.	Course Outcome Description
CO1	Understand principles, advantages, and components of fluid power systems.
CO2	Analyze and differentiate various hydraulic and pneumatic components and circuits.
CO3	Design and simulate basic fluid power circuits for industrial applications.

CO-PO Attainment Matrix for Course (L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H	M							H		
CO2	M	H	M						H	M	
CO3		M	H	H	H				M	H	M

Module No.	Topics / actual contents of the syllabus	Contact Hours
Unit I: Introduction to Fluid Power Systems	• Basics: Hydraulics vs Pneumatics • Applications, advantages, disadvantages • Properties of fluids: Compressibility, viscosity, density • Energy and power in fluid systems • ISO and SAE grades of oil • ISO symbols in hydraulic and pneumatic systems • Safety and hazards in fluid systems • Pascal's law, Bernoulli's principle (brief overview)	**10 Hours**
Unit II: Pumps and Actuators	• Classification and working of pumps: Gear, Vane, Screw, Piston (axial & radial) • Pump performance curves, efficiency, cavitation • Selection and maintenance of pumps	**10 Hours**

	• Control valves: Directional, flow, pressure • Actuators: Linear and rotary types • Reservoirs, accumulators, filters, hoses, seals and fittings	
Unit: -III Pneumatic System Components	• Compressors: Reciprocating, rotary, screw types • Air treatment: Filters, regulators, lubricators (FRL unit) • Pneumatic actuators: Single/double-acting cylinders, telescopic, rotary • Pneumatic valves: 2/2, 3/2, 5/2, 5/3 types • Flow and pressure control valves • Basic hydraulic circuits: Meter-in, meter-out, bleed-off • Introduction to electro-pneumatics and logic valves	**10 Hours**

Reference Books:

1. Andrew Parr, *Hydraulics and Pneumatics*, Elsevier/Newnes
2. S.R. Majumdar, *Pneumatic Systems*, Tata McGraw-Hill
3. Anthony Esposito, *Fluid Power with Applications*, Pearson Education
4. Jagadeesha T., *Introduction to Hydraulics and Pneumatics*, I.K. International
5. Herbert E. Merritt, *Hydraulic Control Systems*, Wiley
6. Pippenger & Hicks, *Industrial Hydraulics*, McGraw-Hill