CURRICULLUM OF 4thSEMESTER

For

DIPLOMA IN AERONAUTICAL ENGINEERING

(Effective FROM 2019-20 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 4th Semester (Aeronautical Engineering)(wef 2019-20)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	EndSem Exams	Exams (Hours)	Total
		Theory							
Th.1		Basic Aerodynamics	4		-	20	80	3	100
Th.2		Manufacturing Technology*	4		-	20	80	3	100
Th.3		Fluid Mechanics*	4		-	20	80	3	100
Th.4		Aircraft Electrical System	4			20	80	3	100
		Total	*16*			*80*	*320*	-	*400*
		Practical							
Pr.1		Aerodynamics Lab	-	-	6	25	75	3	100
Pr.2		Mechanical Engineering Lab	-	-	6	25	75	3	100
Pr.3		Workshop Practice – III	-	-	6	50	50	4	100
Pr.4		Technical Seminar			2	50		-	50
		Student Centred Activities(SCA)		-	3				
		Total	*16*	-	*23*	*150*	*200*	-	*350*
		Grand Total			**39**	**230**	**520**	**-**	**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

TH.1. BASIC AERODYNAMICS

Name of the Course: Diploma in Aeronautical Engineering			
Corse code:		Semester	4th
Total Period:	60	Examination:	3 hrs
Theory periods:	4p/week	Internal Assessment	20
Maximum marks:	100	End Semester Examination	80

A. Rationale:

This subject has been introducedto provide basic understanding of aerodynamics including atmosphere, lift, low speed of airfoil, high lift devices and high speed to the students of aeronautical engineering It aims at enabling the student to understand basic concepts of aerodynamics.

B. Objectives:

On completion of the course content the students will be able to:

1. relate various layers of atmosphere and properties.
2. understand the behaviour of air and airspeed terminologies and apply the basics
3. determine pressure types.
4. Know about the concept of lift.
5. Know about aero foils, its types and loads on aero foil
6. IDENTIFY and analyse the role of high lift devices.
7. understand the concept of high speed aerodynamics and shock waves.

C. Topic-wise distribution of periods

S.L.No.	TOPICS	PERIODS
1.	THE ATMOSPHER	**8**
2.	BEHAVIOUR OF AIR	**9**
3.	THEORY OF LIFT	**11**
4.	LOW SPEED AEROFOIL	**10**
5.	HIGH LIFT DEVICE	**10**
6.	HIGH SPEED AERODYNAMICS	**12**
	Total	**60**

D. COURSE CONTENTS

I. THE ATMOSPHERE

1.1 The atmosphere: Introduction to the atmosphere
1.2 various layers of Atmosphere
1.3 Explanation of various layers of atmosphere with respect to variation of temperature
1.4 Pressure and density with change in altitude Explanation of the diagram showing variation of temperature
1.5 pressure, density, relative Humidity and viscosity of air with change in altitude
1.6 Physical properties of air Fluid pressure

1.7 Composition of air: Explanation of constituents of air using tabular Standard Atmosphere
1.8 Explanation of standard atmosphere
1.9 International Standard Atmosphere(ISA) ,Temperature, Pressure.

2. BEHAVIOUR OF AIR

2.1 Speed of sound
2.2 Bernoulli's Equation and Equation of continuity
2.3 Dynamic pressure ,static pressure, total pressure,
2.4 Explanation of total pressure in terms of dynamic and static pressure
2.5 Air Speed and Ground Speed,
2.6 Methods of measuring Air speed
2.7 Pitot static tube: General features, Types of Pitot tubes in use, location
2.8 AIR SPEED TERMINOLOGY:
2.8.1 Indicated air speed(IAS)
2.8.2 Calibrated Air Speed (CAS)
2.8.3 Equivalent Air Speed (EAS),
2.8.4 True Air Speed (TAS)
2.9 The venturi tube: variation of pressure ,speed, across venturi tube

3. THEORY OF LIFT

3.1 The circulation theory of lift Flow of Air past a circular cylinder Flow past a two dimensional Aerofoil
3.2 Explanation of Air flow about an aerofoil with different amounts of Circulation imposed-diagrams
3.3 Vortex Flow-Formation of Vortex
3.4 Magnus Effect and the wake behind the aerofoil Boundary Layer
3.4.1 Definition of boundary layer
3.4.2 laminar and turbulent boundary layers
3.4.3 boundary layer characteristics
3.4.4 Effect of Reynolds number on boundary layer
3.5 CRITICAL REYNOLD'S number
3.6 Scale effect Simple problem based on above topic.

4. LOW SPEED AEROFOIL

4.1 Introduction and general requirements of aerofoil
4.1.1Aerofoil terminology, explanation of a typical aerofoil with diagram
4.1.2 Forces acting on an aerofoil- Explanation with diagram
4.1.3 Types of Aero foils:
4.1.4 Different aerofoil sections- diagrams
4.2 Centre of pressure(CP)
4.3 Aerodynamic centre
4.4 pitching moment
4.5 Finite wing terminology
4.6 Aspect ratio Factors affecting the performance of the aerofoil -RAF 15,Clark Y,NACA-4 digit and 5 digit series
4.7 Pressure distribution around an aerofoil
4.8 Sweep back wings ,Effect of sweep back on stalling
4.9 Drag
4.10 Components of total drag
4.10.1zero lift drag
4.10.2 lift dependant drag
4.11 stalling effects

4.12 Simple problem based on above topic

5. HIGH LIFT DEVICE

5.1 Introduction to high lift devices
5.2 Flaps
5.2.1 purpose of flaps
5.2.2 action of the flaps,
5.2.3 effect of flaps and slats on lift
5.2.4 Types off flap- plain/camber, split ,tap ,slotted, double slotted
5.3 Fowler
5.4 Principle of operation of SLATS
5.5 Automatic Slots, use of slots

6. HIGH SPEED AERODYNAMICS

6.1 Effect of various speeds on co-efficient of lift
6.2 Effect of various speeds on co-efficient of lift
6.3 Transonic speed
6.4 Use of sweep back on high speed
6.5 Effect of compressibility on Drag Transonic and supersonic
6.6 Aerodynamic Mach waves
6.7 Large pressure waves
6.8 Shock waves- Formation of bow shock wave, Wing surface Shockwaves
6.9 Conditions for shock wave generation, Bottom surface, Top shockwave
6.10 Nature of shockwave
6.10.1 physical effects of a shockwave
6.10.2 Normal shock wave
6.10.3 Oblique shockwave
6.11 Shock stall and Sonic Boom

Syllabus to be covered up to I.A.
Chapter: 1,2,3 and 4

Learning Resources:			
Sl. No	**Title of Book**	**Name of Author**	**Name of Publisher**
1.	Aerodynamics	L J Clancy	McGraw-Hill
2	Basic Aerodynamics	Lalit Gupta &Dr O.P Sharma Fundamental of flight	McGraw-Hill
3.	Mechanics of Flight	Kermode, A.C	McGraw-Hill
4.	Flight without Formulae	Kermode, A.C.	McGraw-Hill

\

TH-2 MANUFACTURING TECHNOLOGY

Name of the Course: Diploma in Aeronautical Engineering.			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONAL:

Engineering basically means production of goods and services for human consumption. The major function of mechanical engineering is to manufacture various products using machineries, production processes and production management techniques. Therefore this is one of the most important subjects to be learned by a mechanical and automobile engineer.

B. COURSE OBJECTIVES:

Students will develop an ability towards

- Comprehending required material properties for cutting tools
- Comprehending machining mechanism principle and factors affecting machining performance
- Comprehendingworkingprincipleandcomponentsinmachiningtoolsincludinglathe, milling,shaping,planning,slottingmachines
- Comprehendingrequirementofsurfacefinishandrealizeprinciplesinvolvedingrinding andsuperfinishingoperations

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Tool Materials	04
02	Cutting Tools	06
03	Lathe Machine	08
04	Shaper	06
05	Planning Machine	06
06	Milling Machine	08
07	Slotter	06
08	Grinding	06
09	Internal Machining operations	06
10	Surface finish, lapping	04
	Total Period:	**60**

D. CONTENTS

1.0 Tool Materials

1.1 Composition of various tool materials
1.2 Physical properties&uses of such tool materials.

2.1 Cutting Tools

2.1 Cutting action of various and tools such as Chisel, hacksaw blade, dies and reamer
2.3 Turning tool geometry and purpose of tool angle
2.5 Machining process parameters (Speed, feed and depth of cut)
2.6 Coolants and lubricants in machining and purpose

3.0 Lathe Machine

3.1 Construction and working of lathe and CNC lathe machine

- Major components of a lathe and their function
- Operations carried out in a lathe(Turning, thread cutting, taper turning, internal machining, parting off, facing, knurling)
- Safety measures during machining

3.2 Capstan lathe

- Difference with respect to engine lathe
- Major components and their function
- Define multiple tool holders

3.3 Turret Lathe

- Difference with respect to capstan lathe
- Major components and their function

3.4 Draw the tooling layout for preparation of a hexagonal bolt &bush

4.0 Shaper

4.1 Potential application areas of a shaper machine
4.2 Major components and their function
4.3 Explain the automatic able feed mechanism
4.4 Explain the construction &working of tool head
4.5 Explain the quick return mechanism through sketch
4.6 State the specification of a shaping machine.

5.0 Planning Machine

5.1 Application area of a planer and its difference with respect to shaper
5.2 Major components and their functions
5.3 The table drive mechanism
5.4 Working of tool and tool support
5.5 Clamping of work through sketch.

6.0 Milling Machine

6.1 Types of milling machine and operations performed by them and also same for CNC milling machine

6.2 Explain work holding attachment
6.3 Construction & working of simple dividing head, universal dividing head
6.4 Procedure of simple and compound indexing
6.5 Illustration of different indexing methods

7.0 Slotter

7.1 Major components and their function
7.2 Construction and working of slotter machine
7.3 Tools used in slotter

8.0 Grinding

8.1 Significance of grinding operations
8.2 Manufacturing of grinding wheels
8.3 Criteria for selecting of grinding wheels
8.4 Specification of grinding wheels
with example Working of

- Cylindrical Grinder
- Surface Grinder
- Centreless Grinder

9.0 Internal Machining operations

Classification of drilling machines

9.1 Working of

- Bench drilling machine
- Pillar drilling machine
- Radial drilling machine

9.2 Boring

- Basic Principle of Boring
- Different between Boring and drilling

9.3 Broaching

- Types of Broaching(pull type, push type)
- Advantages of Broaching and applications

10 Surface finish, lapping

10.1 Definition of Surface finish
10.2 Description of lapping&explain their specific cutting.

CHAPTERS COVERED UP TO IA- 1, 2,3,4,5

LearningResources:

Sl No.	Name of the Book	Author Name	Publisher
1.	Text Book of Workshop Technology	Hazra Choudhury Vol-I & II	MPP Pvt. Ltd.
2.	Text Book of Workshop Technology	W.A.S Chapman Vol-I & II	
3.	Text Book of Manufacturing Process	P.N Rao	TMH

TH-3 FLUID MECHANICS

Name of the Course: Diploma in **Aeroneutical Engineering.**			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONAL:

Use of fluid in engineering field is of great importance. It is therefore necessary to study the physical properties and characteristics of fluids which have very important application in mechanical and automobile engineering.

B. COURSE OBJECTIVES:

Students will develop an ability towards

- Comprehending fluid properties and their measurements
- Realizing conditions for floatation
- Applying Bernoulli's theorem

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Properties of Fluid	08
02	Fluid Pressure and its measurements	08
03	Hydrostatics	08
04	Kinematics of Flow	08
05	orifices, notches & weirs	08
06	Flow through pipe	10
07	Impact of jets	10
	Total Period:	**60**

D.CONTENT

1.0 Properties of Fluid

1.1 Define fluid

1.2 Description of fluid properties like Density, Specific weight, specific gravity, specific volume and solve simple problems.

1.3 Definitions and Units of Dynamic viscosity, kinematic viscosity, surface tension Capillary phenomenon

2.0 Fluid Pressure and its measurements

2.1 Definitions and units of fluid pressure, pressure intensity and pressure head.

2.2 Statement of Pascal's Law.

2.3 Concept of atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure

2.4 Pressure measuring instruments

Manometers (Simple and Differential)

2.4.1 Bourdon tube pressure gauge(Simple Numerical)

2.5 Solve simple problems on Manometer.

3.0 Hydrostatics

3.1 Definition of hydrostatic pressure

3.2 Total pressure and centre of pressure on immersed bodies(Horizontal and Vertical Bodies)

3.3 Solve Simple problems.

3.4 Archimedes 'principle, concept of buoyancy, meta center and meta centric height (Definition only)

3.5 Concept of floatation.

4.0 Kinematics of Flow

4.1 Types of fluid flow

4.2 Continuity equation(Statement and proof for one dimensional flow)

4.3 Bernoulli's theorem(Statement and proof)
Applications and limitations of Bernoulli's theorem (Venturimeter, pitot tube)

4.4 Solve simple problems

5.0 Orifices, notches & weirs

5.1 Define orifice

5.2 Flow through orifice

5.3Orifices coefficient & the relation between the orifice coefficients

5.4 Classifications of notches & weirs

5.5 Discharge over a rectangular notch or weir

5.6 Discharge over a triangular notch or weir

5.7 Simple problems on above

6.0 Flow through pipe

6.1 Definition of pipe.

6.2 Loss of energy in pipes.

6.3 Head loss due to friction: Darcy's and Chezy's formula (Expression only)

6.4 Solve Problems using Darcy's and Chezy's formula.

6.5 Hydraulic gradient and total gradient line

7.0 Impact of jets

7.1 Impact of jet on fixed and moving vertical flat plates

7.2 Derivation of work done on series of vanes and condition for maximum efficiency.

7.3 Impact of jet on moving curved vanes, illustration using velocity triangles, derivation of work done, efficiency.

CHAPTERS COVERED UP TO IA- 1, 2,3,4

Learning Resources:

Sl No.	Name of the Book	Author Name	Publisher
1.	Text Book of Fluid Mechanics	R.K.Bansal	Laxmi
2.	Text Book of Fluid Mechanics	R.S khurmi	S.Chand
3.	Text Book of Fluid Mechanics	R.K.Rajput	S.Chand
4.	Text Book of Fluid Mechanics	Modi & Seth	Rajson's pub. Pvt. lt

TH.4. AIRCRAFT ELECTRICAL SYSTEM.

A. Rationale:

This subject has been introducedto provide basic understanding of aircraft electrical systemincluding wiring, power distribution, electrical equipment and lighting system to the students of aeronautical engineering It aims at enabling the student to understand basic concepts of aerodynamics.

B. Objectives:

On completion of the course content the students will be able to:

1. understand the basics of aircraft electrical systems
2. understand the various aircraft wiring systems.
3. understand the power distributors and controls in aircraft electrical systems.
4. understand the various power conversion equipments in aircraft electrical systems.
5. understand various aspects of aircraft lighting systems.
6. understand the various aspects of airfield lighting systems.

C. Topic-wise distribution of periods.

S.L. No.	TOPICS	PERIODS
1.	INTRODUCTION TO AIRCRAFT ELECTRICAL SYSTEM	**8**
2.	AIRCRFT WIRING SYSTEM	**8**
3.	POWER DISTRIBUTION AND CONTROL	**10**
4.	POWER CONVERSION EQUIPMENT	**12**
5.	AIRCRAFT LIGHTING SYSTEM	**10**
6.	AIRFIELD LIGHTING SYSTEM	**12**
	Total	**60**

1: INTRODUCTION TO AIRCRAFT ELECTRICAL SYSTEM

1.1 Introduction to Aircraft electrical system
1.2 Importance of electrical systems in Aircraft
1.3 General requirements of the electrical system in aircraft

2: AIRCRAFT WIRING SYSTEM

2.1Types of wires used and cables used in aircraft: Explain briefly
2.2Types of cable routing in aircraft: explain importance, reason for correct routing.
2.3 Method of cable identification: explain methods like colour coding, tags, gauge thickness,
printed numbering/name on cable, wiring diagram
2.4 Cable termination and screening of cables: explain the importance
2.5 Junction box: explain purpose, correct identification
2.6 Bonding: explain the need for correct bonding
2.7 Insulation testing: Explain the importance ,periodicity of insulation testing, consequences of
Notcarrying out this test.
2.8 Use of megger and bonding tester: brief explanation on the procedure
2.9 Static discharger: explain the need for static discharger

3: POWER DISTRIBUTION AND CONTROL

3.1 Power distribution and control basics
3.2 Types of switches
3.3 Types of relays, contactors
3.4 Types of fuses
3.5 Types of circuit breakers
3.6 Bus bars, AC and DC power distributor system
3.7 Protection circuit:
3.7.1 Current Protection
3.7.2 Voltage Protection
3.7.3 Frequency Protection

4: POWER CONVERSION EQUIPMENT

4.1 Power conversion equipment: Purpose and usage
4.2Principle of operation Explain briefly
4.3Rectifier-purpose,usage
4.4 Static inverter—need ,usage,
4.5 Rotary inverter—purpose, usage
4.6 Transformer- purpose
4.7 Transformer rectifier unit usage

5: AIRCRAFT LIGHTING SYSTEM

5.1 Types of lighting – Explain briefly why various types of lighting are required in an aircraft
5.2 Cabin lighting
5.3 Reading lighting
5.4 Cockpit lighting
5.5 Luggage cabin lighting
5.6 Aircraft landing lights
5.7 Aircraft indication lights
5.8 Identification rotating beacon: explain the significance

6: AIRFIELD LIGHTING SYSTEM

6.1 Need for Air field lighting ,purpose occasions for use
6.2 Various components of airfield lighting system
6.3 General Airport lighting
6.4 Taxiway Lights
6.5 Runway lights:
6.5.1 Runway edge lights
6.5.2 Runway tresh hold lights & runway end lights
6.5.3 Runway exit lights
6.5.4 Runway centre line lights
6.6 Precision Approach Path Indicator(PAPI)

Syllabus to be covered up to I.A.
Chapter: 1,2,3 and 4

Learning Resources:			
Sl. No	**Title of Book**	**Name of Author**	**Name of Publisher**
1.	A&P Mechanics general hand book AC 65-9A	Federal Aviation Administration (FAA)	Aviation Theory Centre
2	Aircraft Electrical System	EHJ Pallet	Pearson Education
3.	Electrical Technology(VOLUME I AND VOLUME II)	BL Theraja	S. Chand

PR.1. AERODYNAMICS LAB

Name of the Course: Diploma in Aeronautical Engineering			
Corse code:		Semester	4th
Total Periods:	90	Examination:	3 hrs
Theory Periods:	6p/week	Internal Assessment	25
Maximum Marks:	75	End Semester Examination	50

1. Flow Visualisation using water tunnel for different shapes
2. Flow Visualisation using smoke tunnel over a aerofoil section at different angle of attack
3. Measurement of the air velocity using pitot-static tube of different RPM inside wind tunnel
4. Measurement of Pressure distribution over circular cylinder
5. Measurement of Pressure distribution over symmetrical Airfoil
6. Measurement of Pressure distribution over un-symmetrical Airfoil
7. Calculation of lift from Pressure distribution over Airfoil
8. Lift measurement of airfoil at different angle of attack using wind tunnel balance
9. Drag measurement of airfoil at different angle of attack using wind tunnel balance
10. Pitching Moment measurement of airfoil at different angle of attack using wind tunnel balance

PR.2 (MECHANICAL ENGG. LAB-2)

Course code		Semester	4th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P/W	Term Work	25
Maximum marks:	100	End Sem Examination:	75

SL. No	Content
1	Studyof 2-S,4-Spetrol & diesel engine models
2	Determine the brake thermal efficiency of single cylinder petrol engine.
3	Determine the brake thermal efficiency of single cylinder diesel engine.
4	Determine the B.H.P, I.H.P BSFC of a multi cylinder engine by Morse test.
5	Determine the mechanical efficiency of an air Compressor.
6	Studyof pressuremeasuringdevices(manometer,Bourdontube pressuregauge)
7	VerificationofBernoulli'stheorem
8	Determination of Cdfromventurimeter
9	Determination of Cc,Cv,Cd fromorificemeter
10	DetermineofDarcy'scoefficientfromflow throughpipe

PR-3 WORKSHOP PRACTICE-III

Name of the Course: Diploma in **Aeronautical**			
Course code:		Semester	4th
Total Period:	90	Examination	4 hrs
Lab. periods:	6 P/W	Teamwork	50
Maximum marks:	100	End Semester Examination:	50

Course Objectives:

Students will develop an ability towards

- Preparing components and jobs using foundry, welding and machining
- Realizing process parameters involved and their effects

1 Machining Practices

1.1 Job in evolving drilling, boring

1.2 Internal/External threading on Turning jobs

1.3 Job in evolving use of Capstan and turret lathe (Taper Turning & Chamfering)

1.4 All gear lathe, CNC Lathe Trainer Practice

Job involving all turning process on MS Rod & aluminum rod for jobs using CNC Lathe trainer.

2 Metal Machining

2.1 Shaper

Preparation of V Block on CI or MS Blocks

2.2 Milling Machine

Preparation of Spur gear by a milling machine

TECHNICAL SEMINAR (PRACTICAL-4)

Name of the Course: Diploma in **Aeronautical**			
Course code:		Semester	4th
Total Period:	30	Examination	3hrs
Lab. periods:	2 P/W	Term Work	50

A. Objective:

Each student has to select a recent topic of latest technology in the area of Computer Science and present a seminar in front of all students of the class. He/She has to prepare a PowerPoint presentation of the selected topic of minimum 10 slides are the total presentation will be approximately 10 minutes duration .There will be interactive session between the presenter and rest of the students including the faculty members of the dept at the end of presentation .A student has to present at least 2 nos.of seminar during a semester and to submit the report for evaluation.

LIST OF INSTRUMENT FOR Aerodynamics LAB

Sl No	INSTRUMENT	Qty
1	Low speed wind tunnel	1
2	Water Tunnel	1
3	Circular cylinder for pressure distribution measurement	1
4	Symmetrical Airfoil for pressure distribution measurement	1
6	Un- Symmetrical Airfoil for pressure distribution measurement	1
7	Pitot-Static tube	1
8	Water tube manometer	1

List of Equipments of MEL-II

SL. NO.	NAME OF ITEM	QUANTITY
01	MODEL OF 2 STROKE PETROL ENGINE	02 Nos
02	MODEL OF 4 STROKE PETROL ENGINE	02 Nos.
03	MODEL OF 2 STROKE DIESEL ENGINE	02 Nos.
04	MODEL OF 4 STROKE DIESEL ENGINE	02Nos.
05	SINGLE CYLINDER PETROL ENGINE TEST RIG	01 No.
06	SINGLE CYLINDER DIESEL ENGINE TEST RIG	01 No.
07	MORSE TEST APPARATUS	01 No.
08	2 STAGE AIR COMPRESSOR TEST RIG	01 No.
09	PRESSURE MEASURING DEVICES (BOURDON TUBE PRESSURE GAUGE, MANOMETER)	02 Nos. each
10	BERNOULLI'S APPARATUS	01 No.
11	VENTURIMETER APPARATUS	01 No.
12	ORIFICEMETER APPARATUS	01 No
13	FLOW THROUGH PIPE APPARATUS	01 No

List of Equipments of Workshop Practice-III

Sl. No.	Name of Apparatus	QUANTITY
01	RADIAL DRILL MACHINE	01 No
02	ALL GEAR LATHE	06 Nos.
03	CAPSTAN LATHE	01 Nos.
04	CNC LATHE TRAINER	01 Nos.