

Government Polytechnic Mumbai

Department of Instrumentation Engineering

P-19 Curriculum

Semester- I

(Course Contents)

GOVERNMENT POLYTECHNIC MUMBAI
(Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Instrumentation Engineering (Sandwich Pattern)

Term / Semester - I

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
		L	P	TU	Total		Theory			PR	OR	TW	Total
							TH	TS1	TS2				
HU19101	Communication skill	2	2	--	4	4	60	20	20	25*	--	25	150
SC19101	Basic Physics	3	2	--	5	5	60	20	20	25*	--	25	150
SC19109	Basic Mathematics	4	--	--	4	4	60	20	20	--	--	--	100
IS19201	Principles of measurement	3	2	--	5	5	60	20	20	50	--	25	175
IS19202	Instrumentation Workshop Practice	--	4	--	4	4	--	--	--	--	--	50	50
WS19201	Workshop Practice	--	4	--	4	4	--	--	--	--	--	50	50
IS19310	Libre office suite writer and draw (Spoken Tutorial)	--	4#	--	4#	4	--	--	--	--	--	--	--
	Total	12	18	--	30	30	240	80	80	100	--	175	675
Student Centered Activity(SCA)					05								
Total Contact Hours					35								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal assessment, # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2:30 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCS /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Coordinator,
Curriculum Development,
Department of Instrumentation Engg.

In-Charge
Curriculum Development Cell

Head of Department
Department of Instrumentation Engg.

Principal

Programme: Diploma in CE/ME/IT/CO/IS/EE/EC/LG/LT (Sandwich pattern)										
Course Code: HU19101				Course Title: Communication Skills						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
02	02	--	04	60	20	20	25*	--	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill-test are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

Communication skills play a vital and decisive role in career development. In this age of globalization, competition is tough. Hence effective communication skills are important. The subject, Communication Skills introduces basic concepts of communication. It also describes the verbal, non-verbal modes and techniques of oral & written communication.

In this context, it will help the engineering diploma students to select and apply the appropriate methods of communication in various situations and business communication. Students are also required basics of communication and use of different skills.

This course will guide and direct to develop a good personality and improve communication skills. It will enable the students to utilize the skills necessary to be a competent communicator.

Course Outcomes: Student should be able to

CO1	Apply proper communication technique to cope up with the challenges of the modern world.
CO2	Interpret feedback at various situations by using appropriate body language and avoid the barriers in effective communication.
CO3	Able to participate in Group Discussion and Acquire the practical knowledge of an interview.
CO4	Able to develop PowerPoint Presentation and Business correspondence.
CO5	Write letters, circulars, memos, notices, reports and communicate effectively in written communication.

Course Content Details:

Unit No	Topics / Sub-topics
1	Introduction to Communication 1.1 Elements of Communication 1.2 Communication Cycle 1.3 Types of communication 1.4 Definition and Types of Barriers- a) Mechanical b) Physical c) Language d) Psychological 1.5 How to overcome Barriers Course Outcome: CO1 Teaching Hours :6 hrs Marks: 14 (R- 2, U-4, A-8)
2	Non- verbal Communication 2.1 Meaning and Importance of Non-verbal Communication 2.2 Body Language 2.3 Aspects of Body Language 2.4 Graphic language Course Outcome: CO2 Teaching Hours :6 hrs Marks: 12 (R- 4, U-4, A-4)
3	Group Discussion and Interview Skills 3.1 Need and Importance of Group Discussion 3.2 Use of Knowledge and Logical sequence. 3.3 Types of Interview 3.4 Preparing for an Interview Course Outcome: CO3 Teaching Hours :6 hrs Marks: 10 (R-2, U-4, A-4)
4	Presentation Skills 4.1 Presentation Skills - Tips for effective presentation 4.2 Guidelines for developing PowerPoint presentation Course Outcome: CO4 Teaching Hours :4 hrs Marks: 08 (R- 2, U-2, A-4)
5	Business Correspondence 5.1 Office Drafting – a) Notice b) Circular c) Memo d) Email-writing. 5.2 Job Application with resume. 5.3 Business Letters – a) Enquiry b) Order c) Complaint 5.4 Report Writing – a) Fall in Production b) Accident Report Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 16 (R- 4, U-4, A-8)

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Communication	2	4	8	14
2	Non- verbal Communication	4	4	4	12
3	Group Discussion and Interview Skills	2	4	4	10
4	Presentation Skills	2	2	4	8
5	Business Correspondence	4	4	8	16
Total		14	18	28	60

List of experiments: Total 10experiments(or turns) out of 15experiments(or turns)

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO1, CO4	Conversation between students on various situations.	02
2	3	CO2, CO4	Non- Verbal Communication.	02
3	3	CO3, CO4	Group Discussion	02
4	4	CO3, CO4	Mock Interview	02
5	5	CO4, CO5	Business Communication a) Advertisement, Tender, Diary writing. b) Job Application with Resume.	02
6	1	CO1	Communication Barriers	
7	5	CO5	Business Letters – a) Enquiry b)Order c)Complaint	
8	4	CO1, CO4	Speeches- a) Welcome Speech – b) Farewell Speech c) Vote of Thanks	02
9	5	CO5	Report Writing – a) Fall in Production b) Accident Report	02
10	All	CO4	Showing Videos on different types of Communication.	02
11		CO1	*Articles	02
12		CO1	*Preposition and Conjunction	02
13		CO1	*Direct Indirect Speech	02
14		CO1	*Change the voice	
15		CO1	*Vocabulary Building	
Total				30

Note: Experiments No. 1 to 10 are compulsory and should map all units and Cos. Remaining 5 experiments are to be perform on the importance of topic. .* This experiments will be performed in practical hours only.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Communication Skills	Joyeeta Bhattacharya - Reliable Series	9780000176981
2	Communication Skills	Sanjay Kumar, PushpaLata- Oxford University Press	978-0199488803
3	Successful presentation Skills	Andrew Brad bury- The Sunday Times	9780749456627

E-References:

1. Website: www.mindtools.com/page8.html-99k
2. Website: www.inc.com/guides/growth/23032.html-4
3. Website: www.khake.com/page66htm/-72k
4. Website: [www.BMConsultant India Consultant India.Com](http://www.BMConsultantIndia.Com)
5. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-English>
6. MYCBSEGUIDE
7. Website: www.letstak.co.in

CO Vs PO and CO Vs PSO Mapping (Civil Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	1
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	2	1
CO4	3	3	2	1	2	3	2	1	2	
CO5	3	3	2	1	2	3	2	1	2	

CO Vs PO and CO Vs PSO Mapping (Mechanical Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	2	3	2	3	2	2	1
CO2	3	3	2	3	2	3	2	2	1
CO3	3	2	2	1	2	3	2	2	1
CO4	3	3	2	1	2	3	2	2	1
CO5	3	3	2	1	2	3	2	2	1

CO Vs PO and CO Vs PSO Mapping (Electronics Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	1	1
CO4	3	3	2	1	2	3	2	1		
CO5	3	3	2	1	2	3	2	1		

CO Vs PO and CO Vs PSO Mapping (Electrical Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	3
CO2	3	3	2	3	2	3	2	2		3
CO3	3	2	2	1	2	3	2	2		3
CO4	3	3	2	1	2	3	2	1		2
CO5	3	3	2	1	2	3	2			

CO Vs PO and CO Vs PSO Mapping (Instrumentation Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	2	3	2	3	2	1	2
CO2	3	3	2	3	2	3	2	1	2
CO3	3	2	2	1	2	3	2	1	2
CO4	3	3	2	1	2	3	2		2
CO5	3	3	2	1	2	3	2		

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	1
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	2	1
CO4	3	3	2	1	2	3	2		2	
CO5	3	3	2	1	2	3	2		2	

COVs PO and CO Vs PSO Mapping (Information Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	1	1
CO2	3	3	2	3	2	3	2	2	1	1
CO3	3	2	2	1	2	3	2	1		2
CO4	3	3	2	1	2	3	2	1		
CO5	3	3	2	1	2	3	2	1		

CO Vs PO and CO Vs PSO Mapping (LG/LT Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1		2
CO2	3	3	2	3	2	3	2	1		2
CO3	3	2	2	1	2	3	2	1	1	2
CO4	3	3	2	1	2	3	2	1		2
CO5	3	3	2	1	2	3	2	1		2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Neelamkumar R. Sawant	State Head Technical Services for (Maharashtra and Goa)	JSW Cement Ltd. Mumbai Head Office
2	Ms Shilpa D. Khune	Corporate Consultant Trainer	Mahindra Pride Classroom
3	Mrs. S.S. Kulkarni	Lecturer in English	Government Polytechnic, Pune.
4	Mrs. K.S.Pawar	Lecturer in English	Government Polytechnic, Mumbai
5	Mrs. N.N.Dhake	Lecturer in English	Government Polytechnic, Mumbai

Curriculum Development,
Department of Science and Humanities

Head of Department
Department of Science and Humanities

I/C, Curriculum Development Cell

Principal



Programme: Diploma in IS/EE (Sandwich pattern)										
Course Code: SC19101				Course Title: Basic Physics						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	02	--	05	60	20	20	25*	--	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill-test are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

The subject is included under the category of science. The special feature of the subject is to develop the laboratory skill using principles of scientific phenomenon. This course will serve to satisfy the need of the technical students for their development in technical field. The course is designed by selecting the topics which will develop intellectual skills of the students and will guide students to solve broad based engineering problems. Ultimately the focus of the course is to develop psychomotor skills in the students.

Course Outcomes: Student should be able to

CO1	State the different physical quantities, identify the proper unit of it and to estimate error in the measurement of physical quantities.
CO2	Apply laws of motion in various engineering applications.
CO3	Create awareness about the properties and application of light, LASER, Ultrasonic waves, sound waves and nanotechnology in engineering field.
CO4	Identify the physical properties of the various materials such as elasticity, viscosity.

Course Content Details:

Unit No	Topics / Sub-topics
1	Units and Measurements 1.1 Fundamental Physical quantities, examples. 1.2 Derived physical quantities, examples. 1.3 Definition and requirements of unit 1.4 System of units, C. G. S., M. K. S. and S. I. units. 1.5 Rules to write the unit and conventions of units and Significant figures, rules to write significant figures. 1.6 Error – Definition, types of errors and estimation of errors. 1.7 Numerical Course Outcome: CO1 Teaching Hours: 6 hrs Marks: 08 (R- 2, U-2, A-4)

2	<p>Motions</p> <p>2.1 Linear motion –Definition – distance, displacement, velocity, acceleration, retardation, equation of motions, acceleration due to gravity and equation motion under gravity, numerical</p> <p>2.2 Periodic motions: a) Oscillatory motion, b) Vibratory motion, c) S.H.M. d) Circular motion. (only definition and examples), terms related to S.H.M.: Definition: Time period, frequency, amplitude, wavelength, and phase</p> <p>2.3 Angular motion:</p> <p>a) Definition: angular motion, Uniform circular motion, Radius vector, linear velocity, Angular velocity, Angular acceleration,</p> <p>b) Relation between linear velocity and angular Velocity(derivation), Radial or centripetal and acceleration, Three equations of motion (no derivations), Centripetal and Centrifugal force, examples applications.</p> <p>Course Outcome: CO2 Teaching Hours: 10 hrs, Marks: 10 (R- 2 , U- 4 , A- 4)</p>
3	<p>Modern Physics</p> <p>3.1 Photo Electricity Concept of quantum theory of light, Einstein's Photoelectric equation, Characteristics of photo electric effect, application of photo electric effect</p> <p>3.2 LASER</p> <p>3.2.1 LASER introduction</p> <p>3.2.2 Properties of laser</p> <p>3.2.3 Spontaneous and stimulated emission,</p> <p>3.2.4 Population inversion, Optical pumping.</p> <p>3.2.5 Applications of LASER</p> <p>Course Outcome: CO3 Teaching Hours: 8 hrs, Marks: 10 (R- 2 , U- 4 , A- 4)</p>
4	<p>Optics and Ultrasonic Waves</p> <p>4.1 Optics:</p> <p>4.1.1 Revision of reflection and refraction of light.</p> <p>4.1.2 Laws of refraction, Snell's law.</p> <p>4.1.3 Determination of refractive index.</p> <p>4.1.4 Dispersion, dispersive power, Prism formula (derivation)</p> <p>4.1.5 Numerical</p> <p>4.2 Ultrasonic Waves</p> <p>4.2.1 Ultrasonic waves and infrasonic waves.</p> <p>4.2.2 Audible range of soundwave</p> <p>4.2.3 Properties of ultrasonic wave.</p> <p>4.2.4 Applications</p> <p>Course Outcome: CO3 Teaching Hours :6 hrs Marks: 10 (R- 2 , U- 4 , A-4)</p>
5	<p>Nanotechnology</p> <p>5.1 Introduction to nanotechnology.</p> <p>5.2 Definition of nanoscale, nano meter and nanoparticles, nanotechnology.</p> <p>5.3 Definition and examples of nanostructured materials.</p> <p>5.4 Applications of nanotechnology in different fields -</p> <p>a) electronics, b) automobile, c) medical, d) textile,</p>

	e) cosmetics, f) environmental, g) space and defence
	Course Outcome: CO3 Teaching Hours :4 hrs Marks: 8 (R- 2 , U-2 , A-4)
6	General Properties of Matter 6.1 Elasticity: 6.1.1 Deformation, deforming force, internal restoring force, Elastic, plastic and rigid substances, their examples 6.1.2 Definition of elasticity, stress, strain and its types. 6.1.3 Hooke's Law and elastic limit. 6.1.4 Stress versus Strain diagram, yield point, breaking point 6.1.5 Definition Young's Modulus, bulk modulus and modulus of rigidity relation among them. 6.1.6 Factor of safety. 6.1.7 Applications of elasticity. 6.1.8 Numerical 6.2 Viscosity : 6.2.1 Concept and Definition of viscosity, velocity gradient. 6.2.2 Newton's law of viscosity, Co-efficient of viscosity, unit of viscosity 6.2.3 Stoke's law, terminal velocity, derivation of Stoke's formula. 6.2.4 Streamline flow, turbulent flow, critical velocity, examples. 6.2.5 Reynold's number and its significance. 6.2.6 Applications of viscosity 6.2.7 Numerical Course Outcome: CO4 Teaching Hours : 11 hrs Marks: 14 (R- 4 , U- 4 , A-6)

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Units and Measurements	2	2	4	08
2	Motion	2	4	4	10
3	Modern Physics	2	4	4	10
4	Optics and Ultrasonic	2	4	4	10
5	Nanotechnology	2	2	4	08
6	General Properties of Matter	4	4	6	14
	Total	14	20	26	60

List of experiments: Total 10 experiments(or turns) out of 15experiments(or turns)

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO1	To know your Physics laboratory and Use of Scientific Calculator	02
2	1	CO1	To measure the dimensions of given objects and to determine their volume using Vernier caliper	02
3	2	CO2	To determine Acceleration due to gravity by simple pendulum	02
4	3	CO3	To study photoelectric effect by using photo cell	02
5	4	CO3	To determine refractive index by pin method	02
6	6	CO4	To determine coefficient of viscosity of liquid by Stokes' method	02
7	3	CO1	To measure the dimensions of given objects and to determine their volume using micrometer screw gauge.	02
8	2	CO2	To determine stiffness constant by using helical spring	02
9	3	CO3	To study projectile motion	02
10	4	CO3	To plot the characteristics of photo cell.	02
11	4	CO3	Experiments on LASER	02
12	3	CO3	Demonstration on spectrometer	02
13	5	CO4	To study Engineering applications of Nanotechnology	02
14	6	CO4	To determine Young's modulus of elasticity of wire using Young's apparatus.	02
15	ALL	CO1	Showing Video on different applications related to units,	02
Total				30

Note: Experiments No. 1 to 5 (or 6) are compulsory and should map all units and Cos.
 Remaining 4 experiments are to be perform on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Applied Physics	Manikpure & Deshpande S.Chand & company	978-8121919548
2	Applied Physics	B.G.Bhandarkar, Vrinda Publication	0071779795
3	Optics & Optical Fibres	Brijlal Subhramanyan	978-3662527641
4	Engineering Physics	Gaur and S.L. Gupta S.Chand& Company	0-07-058502
5	Physics	Resnick and Halliday Tata McGraw Hills	978-0-071755487-3
6	Physics part I& II	H.C. Varma	9788177091878
7	Properties of Matter	D.S. Mathur	978-8121908153

E-References:

1. www.physics.org
2. www.ferrofphysics.com
3. www.physicsclassroom.com
4. <http://hyperphysics.phy-astr.gsu.edu/hbase/hph.htm>
5. www.youtube.com/physics
6. www.sciencejoywagon.com/physicszone
7. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-physics>
8. MYCBSEGUIDE
9. <https://ndl.iitkgp.ac.in/>

CO Vs PO and CO Vs PSO Mapping (Electrical Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		1
CO2	3						1			
CO3	3				1		1		1	1
CO4	3			2	1		1	1	1	1

CO Vs PO and CO Vs PSO Mapping (Instrumentation Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			2			1	2	
CO2	3						1	1	
CO3	3				1		1	2	
CO4	3			2	1		1	1	

Industry Consultation Committee:

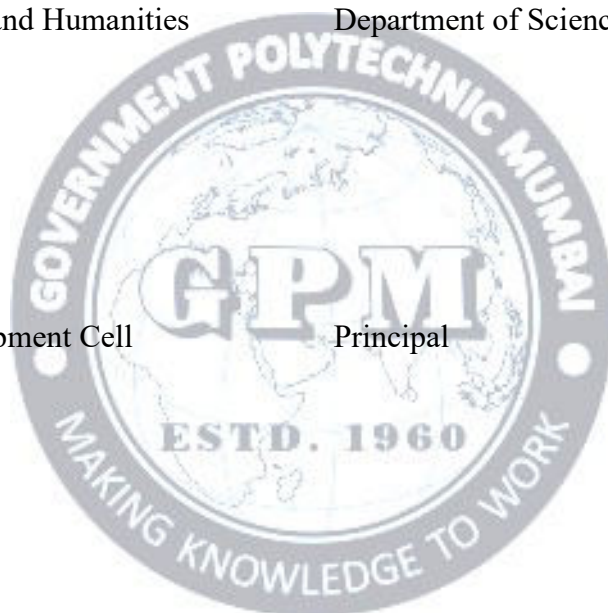
Sr. No	Name	Designation	Institute/Organisation
1	Mr. Rajesh Masane	Sr. Engineer	L&T Mumbai
2	Mrs. B. J. Choudhary	Lecturer in Physics	Govt. Polytechnic Thane
3	Mrs S.A. Thorat	Lecturer in Physics	Government Polytechnic, Mumbai
4	Dr. D.S. Nikam	Lecturer in Physics	Government Polytechnic, Mumbai

Curriculum Development,
Department of Science and Humanities

Head of Department
Department of Science and Humanities

I/C, Curriculum Development Cell

Principal



Programme : Diploma in CE/ME/IT/CO/EC/IS/EE(Sandwich Pattern)										
Course Code: SC19109				Course Title: Basic Mathematics						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30 Hrs)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	-	-	04	60	20	20	-	-	-	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1&TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment), * Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination. Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

This subject is kept under the branch of sciences. This subject intends to teach student basic facts, concepts, principles, and procedure of mathematics as a tool to analyze engineering problems and as such lays down foundation for understanding the engineering and core technology subject.

Course Outcomes: Student should be able to

CO1	Identify the basic principles of mathematics about the field analysis of any engineering problem.
CO2	Apply rules, concept and properties to solve the basic problems.
CO3	Establish relation between two variables.

Course Content Details:

Unit No	Topics / Sub-topics
1	Trigonometry: 1.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), Sub multiple angles 1.2 Factorization and De-factorization Formulae 1.3 Inverse Circular function (definition and simple problems). Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2)
2	Vectors: 2.1 Definition of vector, position vector 2.2 Algebra of vectors (Equality, addition, subtraction and scalar multiplication) 2.3 Dot (Scalar) product & Vector (Cross) product with properties. Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R- 2, U-4, A-4)

3	Logarithms: 3.1 Definition of logarithm 3.2 Laws of logarithm 3.3 simple examples based on laws.	Course Outcome: CO2	Teaching Hours : 10hrs	Marks:10(R-4 , U- 4 , A-2)
4	Probability : 4.1 Definition of random experiment , sample space, event, occurrence of event and types of event (Impossible , mutually exclusive , exhaustive ,equally likely) 4.2 Definition of Probability 4.3 Addition & Multiplication Theorems of probability without proof , simple examples	Course Outcome: CO1	Teaching Hours :10hrs	Marks:10 (R-4, U- 4 , A-2)
5	Determinants:- 5.1 Definition of Determinant 5.2 Expansion of Determinant of order 2X3 5.3 Cramer's rule to solve simultaneous equations in 3 unknowns	Course Outcome: CO2	Teaching Hours :10 hrs	Marks:10 (R- 2 , U-4 , A-4)
6	Matrices: 6.1 Definition of a matrix of order m x n 6.2 Types of matrices 6.3 Algebra of matrices - equality, addition, subtraction ,multiplication & scalar multiplication. 6.4 Transpose of matrix. 6.5 Minor , co-factor of an element. 6.6 Adjoint & inverse of a matrix by adjoint method. 6.7 Solution of a simultaneous equations by matrix inversion method.	Course Outcome: CO3	Teaching Hours : 10 hrs	Marks: 10 (R- 2 , U- 4 , A- 4)

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total
1	Trigonometry	04	04	02	10
2	Vectors	02	04	04	10
3	Logarithms	04	04	02	10
4	Probability	04	04	02	10
5	Determinants	02	04	04	10
6	Matrices	02	04	04	10
Total		18	24	18	60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Mathematics for Polytechnic Students	S.P.Deshpande, Pune Vidyavardhini Graha Prakashan	-
2	Mathematics for Polytechnic Students (Volume I)	H.K.Dass, S.Chand Prakashan	9788121935241
3	Companions to Basic Maths	G.V.Kumbhojkar, Phadke Prakashan	10-B07951HJDQ 13-B07951HJDQ
4	Applied Mathematics	N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh	9789339219567, 9339219562

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9. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths>
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CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		1
CO2	3	2					1	1		1
CO3	3			2			1	1		1

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			2			1	1	
CO2	3	2					1	1	
CO3	3			2			1	1	

CO Vs PO and CO Vs PSO Mapping (COMPUTER ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		
CO2	3	2					1	1		
CO3	3			2			1	1		

CO Vs PO and CO Vs PSO Mapping (INFORMATION TECHNOLOGY)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		1
CO2	3	2					1	1		1
CO3	3			2			1	1		1

CO Vs PO and CO Vs PSO Mapping (ELECTRONICS ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1		1	1
CO2	3	2					1		1	1
CO3	3			2			1		1	1

CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1		1	
CO2	3	2					1		1	
CO3	3			2			1		1	

CO Vs PO and CO Vs PSO Mapping (INSTRUMENTATION ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			2			1	1	1
CO2	3	2					1	1	1
CO3	3			2			1	1	1

Industry Consultation Committee:

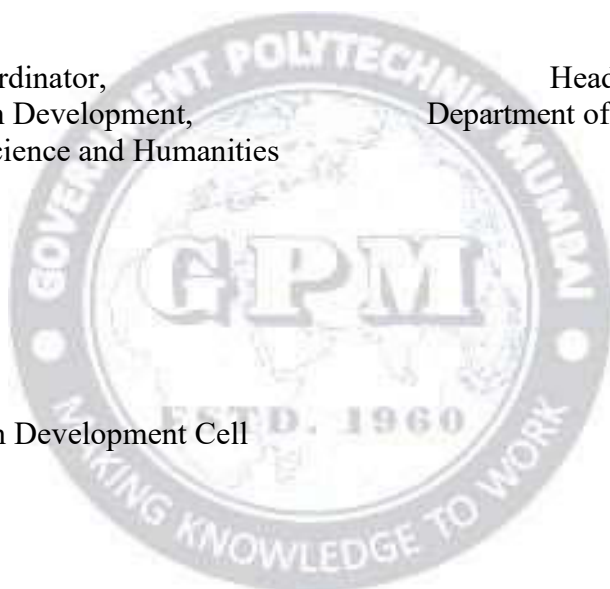
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4	Mr.V.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Science and Humanities

Head of Department
Department of Science and Humanities

I/C, Curriculum Development Cell

Principal



Programme : Diploma in Instrumentation Engineering (Sandwich Pattern)										
Course Code: IS19201				Course Title: Principles of Measurement						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2	-	5	60	20	20	50	--	25	175

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Instrumentation is defined as the art and science of measurement and control of physical variables within a production or manufacturing area. The physical variables like temperature, pressure, flow rate, level, displacement, force, pH, humidity, and etc. are measured in industries to monitor and control the overall operation of plant. For conversion of these physical quantities into electrical forms, various types of transducers are used. Hence it is essential to study the conversion/transduction principles. This course mainly deals with study of various transduction principles as well as characteristics of measuring instruments.

Course Outcomes: Student should be able to

CO1	Discuss concept of metrology and measurement.
CO2	Define the performance characteristics of measuring instruments.
CO3	Demonstrate the transduction principles of different transducers.
CO4	Explain measurement of given process variable using different transducers.

Course Content Details:

Unit No	Topics / Sub-topics
1	Introduction to Metrology and Measurement 1.1 Definitions of Metrology, Types of Metrology 1.2 Definition of Measurement , Instrumentation 1.3 Significance of Measurement .Methods of Measurements,Generalized Measurement System .Applications of Measurement Systems Course Outcome: CO1 Teaching Hours : 4 hrs Marks: 4 (R-2 , U-2, A-0)
2	Instrument's Performance Characteristics 2.1 Classification of Instruments : Active and Passive instruments ,Null-type and Deflection-type instruments , Analogue and Digital instruments , , Smart instruments & non smart instruments 2.2 Types of Performance Characteristics 2.3 Definitions-Static Characteristics of Instruments: Accuracy, Precision, calibration, Range and

	<p>span ,Linearity, Sensitivity , Repeatability & Reproducibility, Resolution & Threshold, Drift, Hysteresis band, Dead zone.(Definition only)</p> <p>2.4 Definitions-Dynamic Characteristics of Instruments: Speed of Response, Dynamic Error, Fidelity.</p> <p>2.5 Errors in Measuring Instruments</p> <p>2.5.1 Types of Errors</p> <p>2.5.2 Sources of Errors</p> <p>2.5.3 Reduction of Errors</p> <p>Course Outcome: CO2 Teaching Hours :10 hrs Marks:12 (R-2 , U-6 , A-4)</p>
3	<p>Transduction Principles of Sensors & Transducers</p> <p>3.1 Different Physical Variables Measured in Industries, Definitions of Sensor & Transducer and their difference, Classification of Transducers.</p> <p>Principle of Operation, List of Examples & Applications of –</p> <p>3.2 Resistive transducers (Potentiometer, RTD, Thermistor & LDR) & Piezo-resistive sensors</p> <p>3.3 Capacitive transducers based on change in area of plates, change in distance between plates and change in dielectric between plates</p> <p>3.4 Inductive transducers- Self-generating type- Electromagnetic type, Electrodynamics type, and Eddy current type Passive type- Variable Inductance type, Mutual Inductance type</p> <p>3.5 Hall-effect sensors ,Piezoelectric transducers</p> <p>3.6 Photoelectric sensors - Photo emissive, Photo conductive and Photovoltaic</p> <p>3.7 Ultrasonic transducers, Radar sensors.</p> <p>Course Outcome: CO3 Teaching Hours :10 hrs Marks:14 (R-4 , U-6 , A-4)</p>
4	<p>Principles of Pressure Measurement</p> <p>4.1 Pressure -Definition, Units of Pressure, Pascal's Law</p> <p>4.2 Absolute, Gauge, Atmospheric, Vacuum, and Differential Pressures.</p> <p>Principles of Operation and Applications of –</p> <p>4.3 Barometer</p> <p>4.4 Manometers- Piezometer , U-tube manometer, Single limb manometer</p> <p>4.5 Bourdon tube- C type, Bellows & Diaphragm</p> <p>Course Outcome: CO4 Teaching Hours :6 hrs Marks:8 (R-0 , U-4 , A-4)</p>
5	<p>Principles of Flow Measurement</p> <p>5.1 Types of fluid flows, Rate of flow or discharge(Q), Continuity equation</p> <p>5.2 Bernoulli's equation for ideal and real fluids and applications</p> <p>Principle of Operation and Applications of –</p> <p>5.3 Venturimeter, Orifice Meter, Rotameter</p> <p>Course Outcome:CO4 Teaching Hours :08hrs Marks:12 (R- 2 , U-6 , A- 4)</p>
6	<p>Principle of Temperature Measurement</p> <p>6.1 Difference between heat and temperature, temperature Scale. Different units of temperature measurement and their conversion</p> <p>6.2 Modes of heat transfer, Thermal conductivity</p> <p>Principle of Operation of –</p> <p>6.3 Thermal expansion thermometers (liquid thermometer, Bimetallic Strip)</p>

	6.4 Thermoelectric thermometers – (Seebeck, Peltier, and Thomson effects)- principle of Thermocouple
Course Outcome:CO4	Teaching Hours : 7 hrs
	Marks: 10 (R- 2 , U-4 , A-4)

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Metrology and Measurement	02	02	--	04
2	Instrument's Performance Characteristics	02	06	04	12
3	Transduction Principles of Sensors & Transducers	04	06	04	14
4	Principles of Pressure Measurement	--	04	04	8
5	Principles of Flow Measurement	02	06	04	12
6	Principles of Temperature Measurement	02	04	04	10
Total		12	28	20	60

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	To identify direct and indirect measuring instruments in the given lab	2
2	2	CO2	To find an accuracy, precision, range and span of mechanical instruments (e.g. Level indicator).	2
3	3	CO3	To verify the resistive transduction principle of transducer.	2
4	4	CO4	To measure gauge pressure and differential pressure using U- tube manometer.	2
5	5	CO4	To measure liquid flow rate using rotameter.	2
6	6	CO4	Measurement of temperature by using temperature sensor.	2
7	2	CO2	To find an accuracy, precision, range and span of electrical instruments (e.g. DMM- voltage, current and resistance).	2
8	3	CO3	To verify the inductive transduction principle by converting displacement / velocity into voltage.	2
9	4	CO4	To measure atmospheric pressure using barometer.	2
10	5	CO4	To measure liquid flow rate using orifice meter.	2
11	5	CO4	To measure liquid flow rate using venturi meter.	2
12	3	CO3	To verify photo conductive principle by converting light intensity into resistance (LDR).	2
13	3	CO3	To verify the capacitive transduction principle by converting liquid level into change in capacitance.	2

14	4	CO4	Identify different pressure mechanical pressure transducer in lab.	2
15	3	CO3	To verify the piezoelectric transduction principle applicable for only dynamic measurement.	2
Total				30

Note: Experiments No. 1 to 5 (or 6) are compulsory and should map all units and Cos. Remaining 4 experiments are to be performing on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	A Course in Electrical and Electronic Measurements and Instrumentation	A.K. Sawhney Dhanpat Rai and co, New Delhi.2015	9788177001006
2	Measurement-And-Instrumentation-Principles-3rd-Edition1	Alan S. Morris Butterworth-Heinemann, Oxford. 2001	9780750650816
3	A TextBook of Fluid Mechanics and Hydraulic Machines (in S.I. Units)	Dr. R. K. Bansal Laxmi Publication, New Delhi. 2018	9788131808153
4	A Textbook on Heat Transfer	Dr. S.P. Sukhatme Universities Press (India) Fourth edition (2005)	9788173715440
5	Instrumentation System and devices	Rangan Mani Sharma Tata McGraw Hill	9780074633502
6	Industrial instrumentation and controls	S.K. Singh Tata McGraw Hill, New Delhi	9780070262225

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5. <https://www.slideshare.net/nsihag/transducers-17950953>
6. <https://en.wikipedia.org/wiki/Transducer>

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	2	1	-
CO2	3	-	-	-	-	-	3	2	-
CO3	-	-	2	2	-	-	2	3	-
CO4	-	-	-	2	-	1	2	3	-

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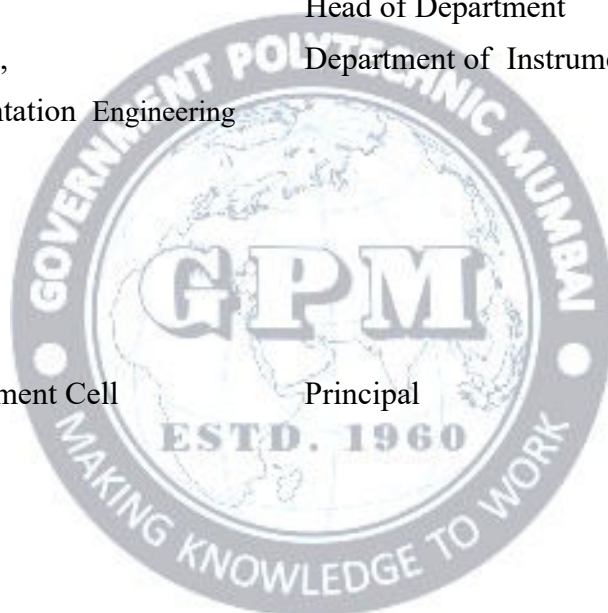
Department of Instrumentation Engineering

Head of Department

Department of Instrumentation Engineering

I/C, Curriculum Development Cell

Principal



Programme : Diploma in Instrumentation Engineering (Sandwich Pattern)										
Course Code: IS19202				Course Title: Instrumentation Workshop Practice						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
--	4	--	4	--	--	--	--	--	50	50

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Instrumentation workshop practice will provide real industrial environment which helps students to develop technician skills related to instrumentation field. The course is designed to impart hands-on-skills in the field of electronics & instrumentation such as testing of electronic components, cables, connectors, soldering and de-soldering techniques, PCB making etc. This course is useful for students to build, test, maintain and troubleshoot simple electronic circuits on PCB.

Course Outcomes: Student should be able to

CO1	Select appropriate tools, components and instrument.
CO2	Test the given electronic components.
CO3	Perform the soldering and de-soldering with utmost safety.
CO4	Develop PCB, assemble components and test the circuit.

Course Content Details:

Unit No	Topics / Sub-topics
1	Tools 1.1 Tools: Nose pliers, wire stripper, screwdrivers, allen keys, cutter, hand hacksaw, soldering iron, de-soldering pump, crimping tools (for RJ-45, RJ-11), and cable testers. (Free hand constructional sketches may be drawn on drawing sheet) 1.2 Multimeters: Need of Multimeter, Analog and digital Multimeter, Measurement of parameter using multimeter. Course Outcome: CO1
2	Switches, Cables and Connectors 2.1 Types of switches: SPST, SPDT, Toggle, thumbwheel, rotary, slide, micro switch, membrane switch. 2.2 Cable: Flat, Ribbon, Co-axial, twisted pair, UTP, Fiber optic. 2.3 Connector Types: PCB edge connector, Berg (strip) connector, FRC connector, D-type, BNC, TNC, MCB, RJ-45, RJ-11, USB (A, B, mini, micro). Course Outcome: CO1

3	Component Testing 3.1 Identification and testing of following components. Resistors, Capacitors, Inductors, Transformers, PN Junction Diode, Bipolar Junction Transistors (BJT), Field Effect Transistors (FET), Unijunction Transistor (UJT), Metal Oxide Semiconductor FET (MOSFET), LED, 7- Segment Displays, SCR, DIAC, TRIAC. 3.2 Terminal identification and major specifications of component from its data sheet. Course Outcome: CO2
4	Soldering and De-soldering 4.1 Soldering Basics: Solder joint: Dry solder joint, cold solder joint, Good and Bad solder joint, Soldering material, Soldering tools: Soldering Iron, soldering station. 4.2 De-soldering Technique: Tools used for de-soldering, De-solder Wick, De-solder Pump 4.3 Precaution during soldering and de-soldering. Course Outcome: CO3
5	PCB Making 5.1 Types of PCB's: Glass Epoxy, paper phenolic, Single Sided, double sided, Selection and application of PCB's. Drawing electronic circuit, designing PCB layout and artwork. Use of paint, Templates, Pen. 5.2 Demonstration of PCB making equipments: Deep coating machine, UV exposure unit, Etching machine, dryer (oven) and scanner with lens. Drilling machine, Shearing machine. Developing negative film and making PCB. Course Outcome: CO4
6	Mini Project 6.1 Selection and testing of components to be used in the mini project. 6.2 PCB layout and artwork design: Transfer the artwork on copper clad, Etching and drilling, mounting and soldering components. 6.3 Testing and fault finding of circuit, Wire harnessing and final assembly along with enclosure. Course Outcome: CO4

Suggested Specifications Table (Theory): --NA---

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	To know Instrumentation Workshop Lab: A) Demonstration for identification and use of tools. (Nose pliers, wire stripper, screwdrivers, allen keys, allen screw, cutter, hand hacksaw, soldering iron, de-soldering pump, crimping tools (for RJ-45, RJ-11), and cable testers.(4 Hours) B) Prepare the sheet of free hand sketch of various tools used in Instrumentation Workshop and write their uses. (4 Hours)	8
2	1	CO1	Multimeters: (A) To identify analog and digital multimeters and to identify different range selection for AC/DC voltage/Current, Resistance, continuity, diode, transistor. (B) To measure resistance, voltage and current using analog and digital multimeter.	4
3	2	CO1	To identify and test various types of switches, cables and connectors (Lead identification, testing, uses).	8

			<p>(A) SPST, SPDT, Toggle, thumbwheel, rotary, slide, micro switch, membrane switch. (2 Hours)</p> <p>(B) PCB edge connector, FRC connector, D-type, BNC, TNC, MCB, RJ-45, RS-232, USB connectors. (2 Hours)</p> <p>(C) Flat, Ribbon, Co-axial, twisted pair, UTP. (2 Hours)</p> <p>Prepare the chart for symbols with terminal identification, uses and testing procedures. (2 Hours)</p>	
4	3	CO2	<p>To identify and test passive components available in your lab:</p> <p>Resistors: Thick film and Thin film resistors, Network and Surface Mount Resistors, Variable Resistors, Special resistors e.g. thermistor, LDR.</p> <p>Capacitors: Dielectric, Variable, Electrolytic: aluminium/tantalum, Film: radial/axial lead, Ceramic.</p> <p>Inductors: Iron core, Ferrite core, Air core, bobbin based, torroidal, multilayer, film, variable, coupled. (by color codes and with multimeter/LCR meter)</p>	4
5	4	CO3	Demonstration and practice of soldering and de-soldering technique.	4
6	5&6	CO4	<p>Mini project:</p> <p>To prepare PCB (with layout, artwork designed by the student) for small electronic circuits.</p> <p><u>Note:</u> Mini project group may consist of 3-4 students. Student has to demonstrate the project and submit the project report.</p>	8
7	3	CO2	To identify and test Diode, LED, BJT, FET, UJT, MOSFET and 7- Segment display using multimeter.	4
8	3	CO2	To identify and test DIAC, SCR and TRIAC using multimeter.	2
9	4	CO3	To identify Solder joint, Dry and cold solder joint, good and bad solder joint, soldering material, soldering tools	2
10	4	CO3	To perform soldering by soldering material & soldering tools. Precaution to be taken during de-soldering	2
11	4	CO3	To perform De-soldering by De-solder Wick, De-solder Pump. Precaution to be taken during de-soldering	2
12	5	CO4	Draw circuit schematic, layout and artwork using one of the PCB making software mentioned below. (Express PCB, Free PCB, EAGLE PCB, workbench etc).	4
13	5	CO4	To identify different types of PCB. Teacher shall explain artwork design rules, types of PCB's: Glass Epoxy, Selection of PCB's, PCB layout and artwork design, Use of paint, Templates, Pen etc paper phenolic, Single Sided, double sided, Selection of PCB's, PCB layout and artwork design, Use of paint, Templates, Pen etc.	4
14	5	CO4	To search information on different PCB making equipments.	2
15	5	CO4	To identify different instruments/ equipments used in making PCB.	2
Total				60

Note: Experiments No. 1 to 5 (or 6) are compulsory and should map all units and Cos. Remaining 4 experiments are to be performing on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electronic Devices and Circuit: An Introduction	Mottershead Allen PHI Learning, New Delhi	9788120301245
2	Electronic Devices and Circuit Theory	Boylestead Robert, Louis Neshelsky Pearson Education, 10 th edition	9788131727003
3	The Art of Electronics	Paul Horowitz Winfield Hill Cambridge University Press, New Delhi	9780521370950
4	Electronics Principles	Malvino, Albert Paul, David McGraw Hill Education	9780073222776
5	Principles of Electronics	Mehta V.K., Mehta Rohit S. Chand and Company	9788121924504
6	Basic Electronic Engineering	Baru V., Kaduskar R. , Gaikwad S.T. Dreamtech Press	9789350040126
7	Fundamentals of Electronic Devices and Circuits	David A. Bell Oxford University Press	9780195425239
8	A text book of Applied Electronics	Sedha R.S. S. Chand	9788121904209

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1. <http://www.alldatasheet.com>
2. <http://www.allelectronics.com>
3. <http://www.techniks.com>
4. <http://www.aplab.com>
5. <https://electronicsclub.info>

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	1	-	1	2	3	-
CO2	3	-	1	3	-	-	2	2	-
CO3	1	-	-	-	-	-	3	1	-
CO4	-	2	3	-	-	-	2	2	-

Industry Consultation Committee:

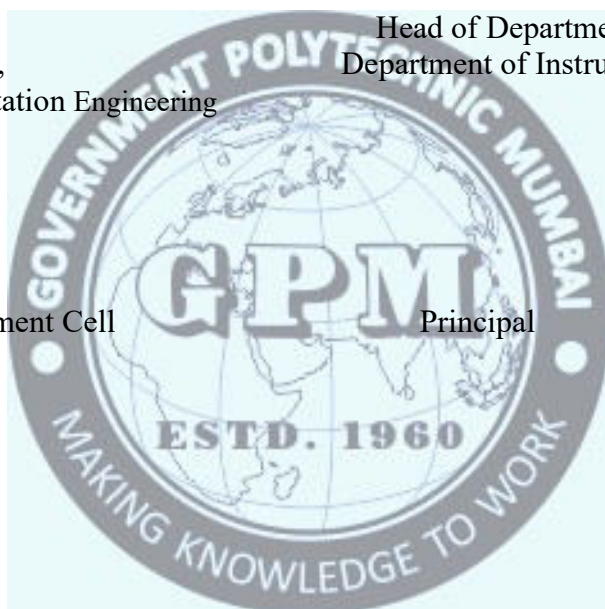
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Department of Instrumentation Engineering

I/C, Curriculum Development Cell

Principal



Programme : ME/CE/IS (Sandwich Pattern)										
Course Code: WS19201				Course Title: Workshop Practice						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
0	4	0	4	0	0	0	0	0	50	50

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26.

Rationale:

Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. The knowledge of basic shops like Wood working, Fitting, Welding, Plumbing and Sheet Metal shop is essential for technicians to perform their duties in industries. Irrespective of engineering stream, the use of workshop practices in day to day industrial as well domestic life helps to solve various minor but critical problems. Working in workshop develops the attitude of working in a group and the basis for safety awareness is created. This foundation course intends to impart basic know-how of various hand tools and their use in different sections of manufacturing. The students are advised to undergo each skill experience with remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the various instructions and practices imparted to them in each hop. Furthermore, the demonstration of CNC Machine will give feel of advancement in industry.

Course Outcomes: Student should be able to

CO1	Lay-outing of shop & Sketching of jobs, tools & equipment.
CO2	Select appropriate tools, machinery, equipment and consumables for given application.
CO3	Use & Operate hand tools, equipment and machinery in different shops.
CO4	Prepare the simple jobs as per specification & drawing.
CO5	Maintain workshop related tools, equipment and machineries.

Course Content Details:

Unit No	Topics / Sub-topics
1	Introduction to workshop: - 1.1 Workshop layout, Importance of various sections/shop of workshop, Types of jobs done in each shop. 1.2 Causes of accidents, general safety rules and work procedure in workshop, Safety signs and symbols, First Aid. 1.3 Fire, Causes of Fire, Basic ways of extinguishing the fire. Classification of fire, Firefighting

	<p>equipment, fire Extinguishers and their types.</p> <p>1.5 Issue and return system of tools, equipment and consumables.</p> <p>Course Outcome: CO1,CO2</p> <p>Teaching Hours : 06</p>
2	<p>Smithy and Forging:-</p> <p>2.1 Sketching, understanding the specifications, materials, various applications and methods used in Smithy and Forging shop along with use of tools like anvil, hammers, Swage block, tongs, chisels, flatters etc;</p> <p>2.2 Demonstration of Smithy and Forging operations like bending, setting down, bulging, Upsetting etc;</p> <p>2.3 Preparation of smithy & forging, job.</p> <p>2.4 Safety precautions & Personal Protective Equipments.</p> <p>Course Outcome: CO1,CO2,CO3,CO4,CO5</p> <p>Teaching Hours :10</p>
3	<p>Carpentry Section :-</p> <p>3.1 Types of wood and their applications.</p> <p>3.2 Types of carpentry hardware's and their uses.</p> <p>3.3 Sketching, understanding the specifications, materials, various applications and Methods used in Carpentry shop along with use of tools like saws, planner, chisels, Hammers, mallet, marking</p> <p>3.4 Demonstration of carpentry operations such as marking, sawing, planning, chiseling, gauge, Vice, try square, rule, etc; Grooving, boring, joining, etc;</p> <p>3.5 Preparation of wooden joints.</p> <p>3.6 Safety precautions & Personal Protective Equipments.</p> <p>Course Outcome: CO1,CO2,CO3,CO4,CO5</p> <p>Teaching Hours: 10</p>
4	<p>Welding Section: -</p> <p>4.1 Types, sketching, understanding the specifications, materials and applications of arc & Gas welding, Accessories and consumables.</p> <p>4.2 Demonstration of metal joining operations like arc welding, soldering and brazing. Show effect of Current and speed. Also demonstrate various welding positions.</p> <p>4.3 Demonstrate gas cutting operation.</p> <p>4.4 Preparation of metal joints.</p> <p>4.5 Safety precautions & Personal Protective Equipments.</p> <p>Course Outcome: CO1,CO2,CO3,CO4,CO5</p> <p>Teaching Hours: 10</p>
5	<p>Fitting Section</p> <p>5.1 Sketching, understanding the specifications, materials, various applications and methods used in fitting, Marking, measuring, work holding, cutting & finishing tools.</p> <p>5.2 Demonstration of various fitting operations such as chipping, filing, scraping, grinding, Sawing, marking, Drilling, tapping, etc;</p> <p>5.3 Preparation of male, female joint.</p> <p>5.4 Safety precautions & Personal Protective Equipments</p> <p>Course Outcome: CO1,CO2,CO3,CO4,CO5</p> <p>Teaching Hours :12</p>
6	<p>Plumbing Section</p> <p>6.1 Types, specification, material , applications and demonstration of pipe fitting tools</p> <p>6.2 Demonstration of pipe fitting operations such as marking, cutting, bending, threading, assembling, Dismantling etc.</p> <p>6.3 Types and application of various spanners such as flat, fix, ring, box, adjustable etc.</p> <p>6.4 Preparation of pipe fitting jobs.</p> <p>6.5 Concept and conversions of SWG and other gauges in use. Use of wire gauge.</p> <p>6.6 Safety precautions & Personal Protective Equipments</p> <p>Course Outcome: CO1,CO2,CO3,CO4,CO5</p> <p>Teaching Hours : 06</p>

7	Lathe and CNC Operations :-		
	7.1	Working principle of lathe along with sketch and procedure for its general maintenance.	
	7.2	Demonstration of Lathe machine operation like plain turning, taper turning, threading, Chamfering, etc.	
	7.3	Simple job demonstration for a group on CNC Machine.	
Course Outcome:CO5		Teaching Hours : 06	

List of experiments:

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO1	Causes of accidents, general safety rules and work procedure in workshop, Safety signs and symbols, First Aid. Perform mock drill session in group of minimum 10 students for Extinguishing fire.	06
2	2	CO1,CO2,C O3,CO4,CO5	Prepare job involving operations like bending, setting down, bulging, upsetting etc; e.g. Pegs (Square/round), Hook, Hammer tongue, Agro equipment etc. (Individually)	10
3	3	CO1,CO2,C O3,CO4,CO5	Prepare two wooden joints as per given drawings. (Individually)	10
4	4	CO1,CO2,C O3,CO4,CO5	Prepare lap joint/butt joint using either arc / gas welding as per given drawing.(Individually)	10
5	5	CO1,CO2,C O3,CO4,CO5	Prepare one Male- Female type fitting job as per given drawing. (Individually)	12
6	6	CO1,CO2,C O3,CO4,CO5	Prepare two pipe joints as per given drawings. (Individually)	06
7	7	CO5	Demonstration of Lathe machine & CNC machine operations.	06
Total				60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Workshop Technology - 1	Hazra and Chaudhary Media promoters & Publisher private limited.	9788185099149
2	Workshop Technology - 1	W.A.J.Chapman Taylor &francis.	9780713132694
3	Workshop Practice Manual for Engineering Diploma & ITI Students	Hegde.R .K Sapna Book House, 2012,	9798128005830
4	Workshop familiarization.	E. Wilkinson Pitman engineering craft series. 1972	978 0273 3167 56
5	Mechanical workshop practice.	K.C.John PHI. 2010	978 812 03416 61
6	Workshop practice manual	K. Venkata Reddy,B. S. Publications. 6 th ed ,2015	978 8178 0030 78

E-References:

1. <http://www.asnu.com.nu> b.c.
2. <http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf> d.
3. <http://www.weldingtechnology.org> e.<http://www.newagepublishers.com>
4. <http://www.youtube.com/watch?v=TeBX6cKKHWY> g
5. <http://www.youtube.com/watch?v=QHF0sNHttw&feature=related> h
6. <http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu> i.
7. <http://sourcing.indiamart.com/engineerig/articles/materials-used-hand-tools/>

CO Vs PO and CO Vs PSO Mapping(Mechanical)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	1	1	2	1	2	2	1	2	2
CO2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2
CO4	3	3	3	3	3	3	3	2	2
CO5	2	2	2	2	2	2	2	2	2

CO Vs PO and CO Vs PSO Mapping(Civil Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	2	1	2	2	1	2	1	--
CO2	2	2	2	2	2	2	2	2	1	--
CO3	2	2	2	2	2	2	2	2	1	--
CO4	3	3	3	3	3	3	3	2	1	--
CO5	2	2	2	2	2	2	2	2	1	--

CO Vs PO and CO Vs PSO Mapping(Instrumentation)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	1	1	2	1	2	2	1	2	1
CO2	2	2	2	2	2	2	2	2	1
CO3	2	2	2	2	2	2	2	2	1
CO4	3	3	3	3	3	3	3	2	1
CO5	2	2	2	2	2	2	2	2	1

Industry Consultation Committee:

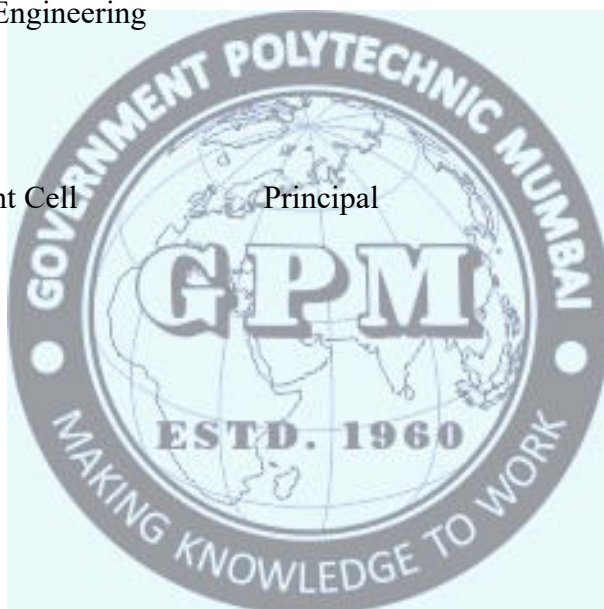
Sr. No	Name	Designation	Institute/Organisation
1	Shri S. V. Joshi	Lecturer	G. P. Mumbai
2	Shri N. M. Ambadekar	Workshop Superintendent,	G. P. Thane
3	Shri D. B. Jadhav	Senior Manager	Auto. Division, Mahindra and Mahindra Ltd., Kandivali

Coordinator,
Curriculum Development,
Department of Mechanical Engineering

Workshop superintendent
Department of workshop

I/C, Curriculum Development Cell

Principal



Programme : Diploma in Instrumentation Engineering										
Course Code:IS19 310				Course Title: Libre Office Suite (Writer and Draw)						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
--	4#	--	4	--	--	--	--	--	--	--

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Course Content Details:

Unit No	Topics / Sub-topics
1	Libre office suite writer 1. Promo of LibreOffice Suite Outline: - LibreOffice promo - Features of LibreOffice - Uses of LibreOffice - LibreOffice formats - LibreOffice tutorials in Spoken Tutorial - Applications of LibreOffice, Libre Office tutorials in various languages 2. Introduction to LibreOffice Writer Outline: Introduction to LibreOffice Writer Basic Features Toolbars How to open, close and save a document Save in MS Office, PDF and other formats Open MS Office Documents Change Bold icon Change Font Size , Change Font Name. 3. Typing text and basic formatting Outline: Typing text and basic formatting Aligning Text in writer Bullet points and Numbering Cut Copy and Paste option Bold/Underline/Italics Font name/Font size/Font color in Writer, Other important and popularly used formatting features. 4. Inserting pictures and objects Outline: Inserting pictures and other objects in a document Inserting pictures Inserting Tables Hyperlinks (within, across documents, from web) Creating tables AutoFormat Optimal Column Width option 5. Viewing and printing a text document Outline: Viewing and printing a text document Viewing Documents Printing Documents Print Layout, Web Layout, Zoom factor , View layout. Page Preview bar Printer functions Quick Printing Print in ,reverse page order 6. Using search replace auto correct Outline: Using search replace auto correct Find, Search, replace for select text Auto-correct feature Spell check Language Settings 7. Typing in local languages Outline: Typing in local languages Using SCIM to type in Indian languages Bilingual typing 8. Using track changes

	<p>Outline: Using track changes as a peer review / collaborative constructivist tool, accepting and rejecting changes How to use record changes to peer review documents, accept/reject these</p> <p>9. Headers Footers and notes Outline: Headers, Footers and notes, Page format – header footer, how these can change within the same document (first page without header footers), Useful footer information (page number, title), Insert Footnotes and endnotes Insert/Remove Header and Footer</p> <p>10. Creating newsletter Outline: Creating newsletter Advanced use as a desktop tool to create a note with multiple columns use features like word count, Spell check, create newsletters in LibreOffice Writer and few operations that can be performed on them.</p>
2	<p>Libre office suite Draw</p> <p>1. Promo of LibreOffice Suite Outline: - LibreOffice promo - Features of LibreOffice - Uses of LibreOffice - LibreOffice formats - LibreOffice tutorials in Spoken Tutorial - Applications of LibreOffice.</p> <p>2. Introduction Outline: Introduction to LibreOffice Draw LibreOffice Draw Create and save an Impress Draw file LibreOffice Draw Workspace Graphics - Bitmap or raster image - Vector graphics.</p> <p>3. Create simple drawings Outline: Create simple drawings Basic shapes (lines, arrows, rectangles and squares, circles) (How to improve upon a water cycle diagram by adding shapes and so on.) Geometric shapes</p> <p>4. Basics of working with objects Outline: Basics of working with objects Cut, copy, paste objects Resize objects dynamically using handles Object Arrangement Adding a new page to a file Group and ungroup objects</p> <p>5. Fill objects with color Outline: Fill objects with color, gradients, hatching and bitmaps Making outlines invisible Adding a shadow to the objects Creating new colors How to import a bitmap into Draw.</p> <p>6. Insert text in drawings Outline: Insert text in drawings Insert text directly inside an object Changing the text color Working with text boxes and formatting text in objects Making the line wider.</p> <p>7. Common editing and print functions Outline: Common editing and print functions Set the draw page for page size and margins Paper size, page count, page numbers, date, and time Undo and redo actions Rename a page Print.</p> <p>8. Polygons and Curves Outline: Curves and Polygons Various types of Polygons Draw directions using arrows Flow charts Insert tables and graphs Page Margins and Orientation Font Type and Size modification</p> <p>9. Edit Curves and Polygons Outline: Use the Edit Points toolbar Insert new points Move existing points Using control lines to change the shape of the objects Group the objects together</p> <p>10. Flow Charts Connectors Glue Points Outline: Draw Flowcharts To Draw Beizer curve Insert text in flow charts Various text insertion options -Resizing shape to fit text width -Word wrap text in shape What is Flowchart.</p>

	<p>11. Working with Objects Outline: What are Grids? What are Guides? What are Snap Lines? Position objects with grids, guides and snap lines Resize objects exactly and duplicate objects Distribute objects.</p> <p>12. Import and Export Images Outline: Import images into a Draw page *as a link * as an embedded image Edit Links Remove links Automatic embedding of images Delete the picture Export the whole Draw file or one or one page of the Draw file Export to a PDF, HTML, JPEG or a bitmap file , Edit Raster images using the Format Picture tool</p> <p>13. Basics of Layers Password Encryption PDF Outline: Basics-of-Layers-Password-Encryption-PDF Layers -Layout -Controls - Dimensions</p> <p>14. Working with 3D objects Outline: Enable the grids and the guide lines How to create 3D objects Extrusion(Creating 3D objects, using 2D objects) 3D Toolbar 3D Rotation Object Typing text in 3D objects using Text tool, Ready-made 3D shapes.</p> <p>15. Set Draw preferences Outline: Learn how to set the following preferences: **Properties **Create versions **View in color/grayscale/black-and-white Setting Title, Subject, Keywords and Comments of a file.</p>
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